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NATIONAL RECLAMATION OF ARID LANDS.

BY

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The year just closed was marked by substantial progress in the work of national reclamation of arid lands. Important structures have been completed, several of the largest engineering works ever attempted in this country are under construction, and detailed plans have been prepared and approved for other works of similar magnitude. The preliminary surveys and examinations, which involved much time and labour, are practically concluded. Out of nearly 100 projects examined, all but 24 have been eliminated for the present, and during the next three years the engineers will concentrate their entire attention upon the building of these great works.

Additions to Personnel.—The magnitude of the works proposed and the opportunity offered for achieving national reputation have made it possible to add to the already strong personnel of the Service a number of noted engineers, although the emoluments of a Government position are neither commensurate with the value of their services nor comparable with what they would obtain from private practice.

Among the new engineers are Carl E. Grunsky, consulting engineer, D. C. Henny and Charles E. Wells, supervising engineers—the former for Oregon and Washington, the latter for southern Wyoming and South Dakota; F. C. Horn, constructing engineer, Minidoka dam; E. D. Vincent, constructing engineer, Laguna dam.

The Reclamation Fund.—Sales of public lands for the fiscal year ended June 30, 1905, netted the Reclamation Fund \$4,757,578.87, which, added to the amount in the Treasury, makes a total of \$28,028,571.50. The estimated increment to the fund for the years 1906,

1907, and 1908 is \$9,000,000, making a total of \$37,028,571.50, which will be available for irrigation work during those years.

The allotments now made and the proposed allotments to various States and Territories in the order of their magnitude are as follows:

ARIZONA.....	Salt River.....	\$3,850,000.00	
NEBRASKA-WYOMING.....	North Platte.....	3,330,000.00	
MONTANA.....	Huntley.....	\$ 900,000	
	Lower Yellowstone.....	1,200,000	
	Milk River.....	1,000,000	
			3,100,000.00
OREGON.....	Klamath.....	\$2,000,000	
	Umatilla.....	1,000,000	
			3,000,000.00
CALIFORNIA-ARIZONA.....	Yuma.....	3,000,000.00	
NEVADA.....	Truckee-Carson.....	3,000,000.00	
IDAHO.....	Minidoka.....	\$1,300,000	
	Payette-Boise.....	1,300,000	
			2,600,000.00
COLORADO.....	Uncompahgre.....		2,500,000.00
WASHINGTON.....	Okanogan.....	\$ 500,000	
	Tieton.....	1,000,000	
	Sunnyside.....	750,000	
			2,250,000.00
WYOMING.....	Shoshone.....		2,250,000.00
SOUTH DAKOTA.....	Belle Fourche.....		2,100,000.00
NORTH DAKOTA.....	Pumping Projects.....	\$1,000,000	
	Lower Yellowstone.....	700,000	
			1,700,000.00
UTAH.....	Strawberry Valley.....		1,250,000.00
NEW MEXICO.....	Hondo.....	\$ 240,000	
	Carlsbad.....	600,000	
	Rio Grande.....	200,000	
			1,040,000.00
KANSAS.....	Garden City.....		260,000.00
	Unassigned balance of estimate.....		1,798,571.50
			\$37,028,571.50

PROJECTS UNDER CONSTRUCTION.

The general map which is published herewith shows the scope of the work, the location of the projects which have been approved, the areas to be irrigated, and the subdivision of the country into districts, each of which is in charge of a supervising engineer.

As before stated, in the sixteen States and Territories 24 projects have been approved, and on 13 of these actual construction is now going on.

Arizona—Salt River Project.—In the order of magnitude and prominence of its engineering features the Salt River project ranks

first. Actual construction has been going on since April, 1904, and a commendable progress has been made. The accepted plans for this project involve the construction of one of the highest dams in the world, which will be known as the Roosevelt dam. It will be of uncoursed rubble masonry (sandstone and cement), with arch upstream. It will be 800 feet long on top, 235 feet at the river-bed, and its contents will be 300,000 cubic yards. It will rise 284 feet above the lowest foundation, and the height of water against it will be 230 feet. The location of the dam site is sixty-two miles from Phoenix, at a point just below the junction of Salt River and its tributary, Tonto Creek. The dam will lock a narrow cañon and create one of the largest artificial lakes in the world. This lake will contain 1,400,000 acre-feet, or sufficient water to cover that many acres one foot deep. Its capacity is fourteen times greater than the Croton reservoir, and it will store more water than the Assuan dam in Egypt.

Owing to the inaccessible location of the site, the preliminary work has been arduous and expensive. It was necessary to construct a highway for more than forty miles through an exceedingly broken and rugged country. A large part of the distance is in cañons, and for miles the road is literally hewn out of the solid rock. In many places it hugs precipices 1,000 feet high. The municipalities of Phoenix, Mesa, and Tempe, in order to become supply-points for the army of labourers which will be almost constantly employed on this work during the next three years, contributed \$75,000 to defray a part of the cost of the roadwork.

All of this work was done by the Government and not by contract, and a rather interesting feature was the employment of a large number of Apache, Pima, Papago, and Maricopa Indians as day labourers. The experiment was eminently successful, as the Indians proved industrious and faithful, and were especially useful with pick and shovel.

In the construction of the dam 240,000 barrels of cement will be required. The cost of cement, delivered at the dam site by any private agency, would have been almost prohibitive. Owing to a fortunate discovery of the material required for its manufacture near the dam site, it was decided to erect a mill and furnish cement to the contractor. This mill has been in successful operation for several months, and is now turning out 300 barrels a day of first-class cement at a cost which will save the farmers over a million dollars on the first bid submitted by the manufacturers.

The Government has already constructed a power canal, which is supplying the power required for its mill, for the electric lighting

of headquarters, etc., and later will furnish 4,000 horse-power to the contractor who is building the dam.

During the early progress of the work the Government operated two saw mills, which cut many millions of feet of lumber from the forest reserves near-by.

In the lower end of the reservoir, on a flat just above the river, is located the thriving little city of Roosevelt, a city of 2,000 people, with water works, electric lights, schools, stores, churches, etc. When the dam is completed the site of this town will be submerged nearly 200 feet. Work on the dam has been greatly delayed by reason of several unprecedented floods, the last of which, in December, swept away all of the false works and much of the machinery of the contractor. The Salt River project will cost \$3,850,000, will irrigate from 160,000 to 200,000 acres of land, and will be completed in 1909.

Nevada—Truckee-Carson.—On June 17, 1905, the third anniversary of the Reclamation Act, occurred the formal opening of the first completed work of the Reclamation Service. In the presence of a distinguished body of Congressmen, Governors, legislators, engineers, and others the sluices in the Truckee dam were shut down, the headgates of the great canal were opened, and the waters of the Truckee River for the first time were turned into the Carson River reservoir, from whence long lines of canals and ditches will carry it out upon the desert. (Plate 1.)

The location of this work is in the bed of Lake Lahontan, and embraces what was long known as Forty-mile Desert, one of the most desolate and arid spots on this continent. (Plate 2.)

The great dams on the Truckee and Carson Rivers, the former 110 feet in height, are beautiful and finished products of modern engineering. The long lines of canals, many of them large enough to carry rivers, in places are lined with cement, and obstacles in the route, such as hills, are tunnelled, and the tunnels are cement-lined. Already more than \$2,000,000 have been expended on this work. When completed the Truckee-Carson project will cost more than \$9,000,000, and will render productive more than 400,000 acres of land now practically worthless, but which, irrigated, will readily sell for \$30,000,000. (Plate 3.)

Colorado—Uncompahgre Valley Project.—One of the most spectacular pieces of engineering ever attempted in the West is involved in the construction of the Uncompahgre project in western Colorado. The initiation of this work took place only after engineering ingenuity had been taxed to its utmost in the completion of surveys and plans of structures.

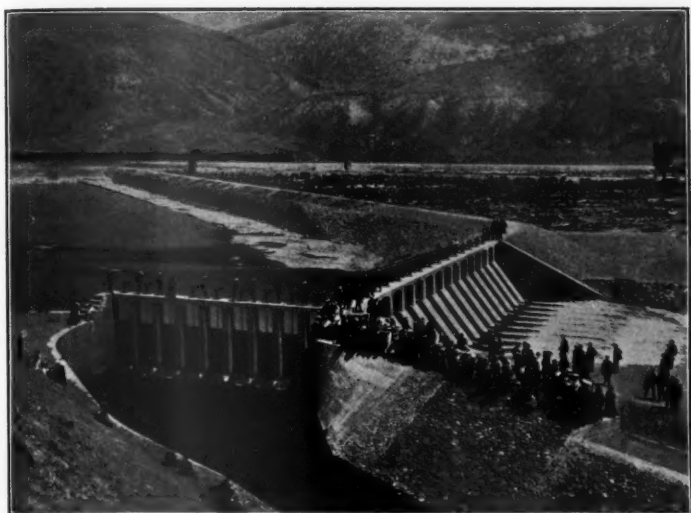


PLATE 1.—COMPLETED TRUCKEE DAM: CANAL OPENED JUNE 17, 1905.



PLATE 2.—CARSON DAM: CANAL OPENED JUNE 17, 1905.



The plans involve the boring of a tunnel with a cross section of $10\frac{1}{2}$ by $11\frac{1}{2}$ feet for a distance of more than 30,000 feet, and passing for the greater part of its length 2,000 feet below the surface of Vernal Mesa. By this tunnel it is proposed to carry the waters of the Gunnison River, now flowing uselessly in a profound cañon, into Uncompahgre Valley, to supplement the insufficient flow of the Uncompahgre River and furnish a permanent supply for more than 100,000 acres of exceedingly fertile land. In the location of a site for a tunnel and a low diversion dam in the Gunnison Cañon, Mr. A. L. Fellows, engineer in the Reclamation Service, performed an act of heroism and daring seldom equalled in the annals of engineering work. Accompanied by one companion, with their kit loaded on an inflated rubber mattress, he passed through the most dangerous part of the Gunnison Cañon, successfully locating a feasible point for diversion and a tunnel site. Following his investigations an extremely dangerous piece of topographic surveying was then completed. This was a survey of about 1,500 feet of the bottom of the Grand Cañon of the Gunnison River, the cañon at this point being approximately 2,000 feet in depth, with precipitous walls. It was necessary to descend into the cañon over cliffs and through narrow fissures in four places. At these points the descent was extremely perilous, and was accomplished only by the use of ropes, over steep cliffs hundreds of feet in height. When the surveys were finished construction was immediately begun upon a roadway leading into the cañon. This road has been completed, the heavy machinery for the power plant is already installed, and the excavation of the tunnel is progressing rapidly. The first mile, or one-sixth of the tunnel, was completed on the 17th day of November.

The Government is doing this work under force account, working three shifts a day of eight hours each on each of the three openings. On the Uncompahgre side the tunnel will connect directly with an elaborate system of canals and ditches extending down the valley on both sides of the river. The completion of this work will add 2,000 homes to the valley, and will increase the taxable wealth of Colorado by not less than \$10,000,000. The estimated cost of the whole project is approximately \$2,500,000, which must be returned to the Government in not less than ten years after completion by the owners of the lands which are to be irrigated.

Wyoming and Nebraska—North Platte Project.—This project involves the construction of the Pathfinder dam in the cañon of the North Platte River in Wyoming, just below its junction with Sweetwater River. This dam will be known as the Pathfinder, commemo-

rating an episode in the life of the noted explorer Gen. John C. Fremont, who nearly lost his life while attempting the passage of this cañon in a boat.

The dam will have a height of 210 feet, and will create a reservoir storing more than a million acre-feet of water. The actual construction of this dam is well under way. A concrete bulkhead has been built at the western end of the completed outlet tunnel, to control the water during the installation of the gates for the dam. The water stored in the Pathfinder reservoir will be carried in the channel of the stream for many miles, and will then be diverted into the Interstate Canal, having a length of 140 miles and covering lands in eastern Wyoming and western Nebraska. The excavation of the upper forty-five miles of the Interstate Canal was begun in June, 1905, and 33 per cent of the work was completed on January 1, 1906. The North Platte project involves the expenditure of \$3,330,000, and will reclaim 100,000 acres of land.

Wyoming—Shoshone Project.—This project contemplates the utilization of a portion of the surplus waters of the Shoshone River for the reclamation of land in the northern part of Big Horn County, Wyoming. It involves the construction of the Shoshone dam, a concrete masonry arch, and the highest structure of its kind in the world. This dam will lock a very narrow cañon, so that in cubical contents it will not compare with any of several other dams, but in its great height it exceeds them all. From bed-rock to top it will be 310 feet high; at its base it is only 85 feet long, and on top only 200 feet. The preliminary work on this structure has been attended with great difficulties, owing to the almost inaccessible location of the dam site and the unexpected conditions which were found in the river-bed. The diamond drills went down 88 feet in places before finding a permanent base, and boulders 38 feet in thickness were penetrated, resting on beds of sand and gravel. (Plate 5.)

As in Arizona, it was necessary to construct a road up the cañon for several miles. This road has been completed, and work is well along on the outlet tunnel and temporary diverting works. When completed the Shoshone project will cost \$2,250,000, and will irrigate 75,000 acres.

Montana Projects.—This State is destined to become one of the chief beneficiaries of the Reclamation Act, for the reason, principally, that no other State presents greater opportunities for the development of irrigation projects. Ten feasible projects have been investigated. Of these, three have been approved and funds allotted, and upon two actual construction is under way.

The Lower Yellowstone Project.—This project provides for a diversion dam in the Yellowstone River at a point nineteen miles northeast of Glendive and the irrigation of 66,000 acres in Montana and North Dakota. The diversion dam will be located so as to permit the canal being taken out where it will be protected from the shock of large ice-gorges, which cause considerable damage along the stream every few years. The dam will be a timber-covered, rock-fill, curved face down stream, allowing easy passage of ice and debris during spring floods. The head gates consist of eleven circular openings, 5 feet in diameter, set in reinforced concrete with massive timber-protection. The main canal will be sixty miles long, and will carry 830 cubic feet per second. The cost of the project will be about \$1,800,000.

Huntley Project.—Located in the northern portion of the Crow Indian Reservation, in southern Montana, is the Huntley project, which will irrigate 30,000 acres of exceptionally fine land. The water is diverted directly from the Yellowstone River near Billings, and reaches the irrigable lands in about two miles. All of the irrigable area is Government land recently ceded to the United States by the Crow Indians. The works now being constructed and to be completed in 1907 are the following: Main canal, 33 miles long, with three short tunnels in the first two miles; pumping station, 14 miles from headquarters, which will develop power from a 33-foot drop in the canal and irrigate from 3,000 to 4,000 acres of upper bench-land. In addition to the actual cost of construction, settlers must pay the Indians \$4 per acre for their land.

Idaho—Minidoka Project.—During the coming summer the engineers expect to turn water from the Government canals upon a large tract of sage-brush land known as the Minidoka tract, in southern Idaho. Work has been steadily going on for nearly a year on the construction of a rock-fill dam across Snake River, and the main channel is now closed. Nearly 100 miles of main canal and laterals are completed, and sub-laterals are being extended to reach every farm in the project. A remarkable transformation has taken place at this point since the beginning of this work. A year ago last spring the writer accompanied the engineer in charge and camped for the night on the banks of the Snake River. Save for our own camp, there was no other evidence of habitation; only a vast expanse of sage brush extending to the horizon on every side. Last October, travelling in a first-class passenger coach over a new railroad, the writer again inspected the tract. He passed through three new towns, containing a total of 120 business-houses, including

three newspapers and three banks. On every eighty acres there was a farm house, in which dwelt a family, and where only a little over a year ago all was desolation there now live 4,000 people. The first school house opened with 70 pupils in attendance. All of this development has come in advance of the completion of the works, for not a drop of water is yet available from the canal system. In April the Government will hold an auction sale of town lots, and three new towns will be created in the desert. Excellent opportunities will be offered for investment, with good openings for tradesmen and manufacturers.

Oregon and California—Klamath Project.—Without doubt the Klamath project in southern Oregon and northern California is unique among all the proposed works. It involves irrigation and drainage in unusual combination. The Klamath Basin contains about 400,000 acres of land, 240,000 acres of which are involved in this project. In the tract are three large lakes—the Upper and Lower Klamath Lakes and Tule Lake. Upper Klamath Lake is about 50 feet above the irrigable lands, and furnishes the reservoir and water supply for a large part of the project. Lower Klamath Lake is to be drained by cutting a canal through the natural dike which preserves its present level. Its exposed bed will then be irrigated by canals from the main system. Tule Lake receives its water from Lost River, a winding stream which rises only six miles from where it empties, but covers more than sixty miles in its course. A dam will be built in Lost River, and the waters will be turned into canals to irrigate a large area in the valley. Tule Lake will dry up, and its bed will be divided into farms and irrigated from the main system. The works are simple, and the cost of water the cheapest of any of the proposed Government works. About \$4,000,000 will be required to complete the works.

South Dakota—Belle Fourche Project.—This project is located in the Belle Fourche Valley northeast of the Black Hills, and will irrigate approximately 85,000 acres, at a cost of about \$32 per acre. The works are well under way, consisting of a diversion dam in the river and a large inlet canal connecting with Owl Creek reservoir. A large force of men is now at work on the Belle Fourche dike, the largest earthen embankment in this country. This dike, which closes the outlet to the reservoir, will be 6,200 feet long on top, 115 feet high, and its cubical contents will be 42,700,000 cubic feet, or about one-half that of the Pyramid of Cheops. It will create an artificial lake larger than any body of water in the State. About 65 per cent of the land under this project belongs to the Government, and



PLATE 3.—CEMENT-LINED CANAL, TRUCKEE-CARSON PROJECT, NEVADA.



PLATE 4.—LAYING FOUNDATION FOR LAGUNA DAM, 4,780 FEET LONG: ARIZONA-CALIFORNIA.



settlers are rapidly taking up homesteads. The population of the valley has more than doubled in the last year.

New Mexico—Hondo Project.—The plans and estimates for three projects in this Territory have been approved. Actual construction is well along on one of these, and work will be begun very soon on the others. The Hondo project is one of the minor works, embracing only 10,000 acres of land and involving a cost of \$240,000. Rapid progress has been made on the work, and water will be available this spring. The flood-waters of Hondo River are diverted into a storage reservoir having a capacity of 40,000 acre-feet by a canal two miles long. The distributing canal will have a total length of sixteen miles, and will cover a compact body of exceptionally fine land near Roswell.

California and Arizona—Yuma Project.—Especial interest attaches to this project by reason of the great similarity of the lower valley of the Colorado River to that of the Nile in Egypt. Like the Nile, the Colorado River rises in distant mountains and towards its mouth traverses a semi-tropical and practically rainless desert. The valley is subject to annual inundations, the floods depositing immense quantities of rich sediment, which below Yuma have formed a great delta. (Plate 4.)

Prominent features of the engineering work are the Laguna dam across the river and a complete system of levees on both sides of the Colorado and Gila Rivers, to provide against annual inundation of the bottom lands. The Laguna dam is of the East India weir type, and the first of the kind to be constructed in this country. Its length will be 4,780 feet; its height, 19 feet; maximum width, 267 feet. The apron at the toe of the dam will be 50 feet wide, and the total contents of the structure will be 356,000 cubic yards. The dam is of a type unusual in this country, as it rests upon the sand and not on bed-rock. Owing to the treacherous amount of silt carried by this stream, the diversion gates are arranged to draw off only the top foot of water. The sum of \$3,000,000 has been set aside for this project, and this will provide for the reclamation of about 85,000 acres, mainly in private ownership.

The length of the growing season at Yuma is twelve months, and the earliest vegetables in the United States are produced here.

Conditions in the Lower Colorado Valley have undergone a remarkable change in the past few years. In 1900 a large canal was constructed near the international boundary to supply several thousand acres in what is known as Imperial Valley, in southern California. Excessive floods in the early spring destroyed the head-

works of this system and greatly enlarged the opening. Successive floods increased the size of the canal, and to-day practically the entire flow of the Colorado River is passing through it and northward through old river-channels into Salton Sink. The salt works have been completely destroyed, and the railroad has been forced to rebuild on higher ground. A great inland sea sixty miles long and many miles in width has been created and is rising at the rate of an inch a day. Strenuous efforts have been put forth to force the river back into its old channel, but thus far without avail. The threatened submergence of a large part of Imperial Valley, entailing the destruction of property valued at many millions of dollars and the ruin of nearly 10,000 people who reside there, has attracted the attention of several of the best engineers in the country, who are now endeavouring to find a way to return the Colorado to its channel.

PROJECTS APPROVED.

Washington Projects.—The Secretary of the Interior in December of last year approved three projects in Washington, and set aside the sum of \$2,250,000 for their construction. Two of these are located in the famous Yakima Valley and the other in the northern part of the State, on the Okanogan River.

The investigations of the Reclamation Service in Yakima Valley during the past two years indicate that storage can be developed to provide a supply for 300,000 acres, and plans are being made for the construction of a comprehensive system of canals to cover that area. The work is being considered in divisions, each of which, it has been found, can be treated as a separate unit. These divisions are as follows: The Ledbetter Division, 210,000 acres; Sunnyside Division, 40,000 acres; Tieton Division, 24,000 acres; Kittitas Division, 60,000 acres. The engineering works are comparatively simple, and, although expensive, it is believed feasible to extend the Government work to cover this entire area.

Sunnyside Sub-project.—This project involves the purchase, enlargement, and extension of the Sunnyside Canal system, and in connection therewith the construction of suitable storage works at the upper Yakima Lakes, in order to reclaim 40,000 acres of arid lands in addition to the areas now supplied from the present system.

Tieton Sub-project.—This is an integral part of the Yakima Valley system, and provides for the irrigation of 24,000 acres near and west of North Yakima. The water supply will be from the Tieton River, the natural flow of which at all times will suffice for the requirements of the project.

Okanogan Project.—This project contemplates the irrigation of about 10,000 acres of land in the Okanogan Valley. The limited area of the tract and its location in the heart of an extensive range country which would be dependent upon it for its winter feed insure a profitable and permanent market for forage. The lands are well adapted to the production of deciduous fruits and nuts, which yield large returns when cultivated. The present value of non-irrigated land is about \$5 an acre; when irrigated it is worth from \$40 to \$100. Small fruits, vegetables, wheat, and alfalfa are raised. On account of the possibilities for high development the farm unit will be small. A number of small lakes will be utilized as reservoirs by constructing rock-fill dams at their outlets. Five hundred thousand dollars have been set aside for the construction of the works.

Montana—Milk River Project.—Owing to the international features involved in this project, progress has been slow. The plans for the St. Mary dam are now ready, and advertisements for bids are being published. A number of unusual features are noted in this scheme of reclamation which entitle it to especial consideration.

Two important streams, St. Mary and Milk Rivers, rise in northern Montana and flow northward into Canada. The waters of the St. Mary ultimately reach Hudson Bay. Milk River, after continuing in Canada in a general course parallel to the international boundary, crosses back into Montana and empties into Missouri River. The valleys of these streams in this country are markedly dissimilar. St. Mary intercepts a mountain drainage and skirts along the foot of the range, its headwaters being in a region of remarkable glaciers. Milk River drains a broad, gently-rolling country well adapted to irrigation. As St. Mary River cannot be utilized in its own valley in Montana, it is proposed to carry it over into Milk River by means of a canal thirty-seven miles long, and thus augment the insufficient flow of the latter. The international features are due to the fact that Canada is already utilizing the waters of both of the streams, and is now projecting works on Milk River which threaten loss of crops and ruin to several hundred farmers in Montana residing in the lower valley. Canada is using water which rises in this country; and if the comity of nations is to be preserved, some amicable division of these waters must be made at an early date or grave complications are certain to arise. A treaty is being drawn to effect this peaceful settlement. It is believed that the addition of the stored waters of St. Mary River will enable both countries to maintain the present diversions of Milk River, and will also furnish a

supply sufficient to irrigate 100,000 acres of new land in Montana. Pending the passage of the treaty, the Secretary of the Interior has authorized the construction of a dam in St. Mary River and the building of a canal through the low divide between the two streams. In the event of failure in making a treaty, it is proposed to use these works for irrigating a large body of land in the eastern part of the Blackfeet Indian Reservation. An allotment of \$1,000,000 has been made for initiating this work.

Idaho—Payette-Boise Project.—This project is located in the pleasant valley of Boise River, with the thriving little city of Nampa about the central point. It provides for the reclamation of 372,000 acres, or twice the cultivated area of Rhode Island. The section is noted for its fine climate, and for the wide variety and large yields of its products. At present it has a population of 15,000; but when the Government works are completed it will easily sustain a population as large as Salt Lake Valley, or 120,000 people. The works involve no difficult engineering features, the plans providing for storage on the Payette and Boise Rivers and the diversion of the surplus water of the former into the valley of the latter by means of a large canal cut through the hills which separate the streams. In their entirety the works will cost \$9,000,000, and will require several years in construction.

Oregon—Umatilla Project.—One of the smaller of the proposed works is the Umatilla project, in eastern Oregon. While less than 20,000 acres are involved, the favourable climate, the fertile soil, and its adaptability to a very wide variety of crops make this one of the most attractive projects yet undertaken. The land is best suited for orchards and small fruits, and when so used from 10 to 20 acres are ample for the support of a family. The climate is warm, the elevation only 500 feet above sea-level, and fruits and vegetables are the earliest on the market. The transportation facilities are excellent, the markets being the large cities of Portland and Spokane. The engineering works are very simple; and while the cost of water is \$50 per acre, this is relatively low when compared with the value of products. The soil experts predict a populous and prosperous community here in a short time after the water is applied to the soil.

New Mexico—Rio Grande Project.—The Rio Grande project provides for the irrigation of 180,000 acres of the rich valley lands along the Rio Grande in New Mexico and Texas. The engineering works involved are the Engle dam, to be built of cyclopean concrete, arched up stream, and 250 feet high. Its length at crest will be 1,150 feet, and at river-level 400. This dam will create an artificial

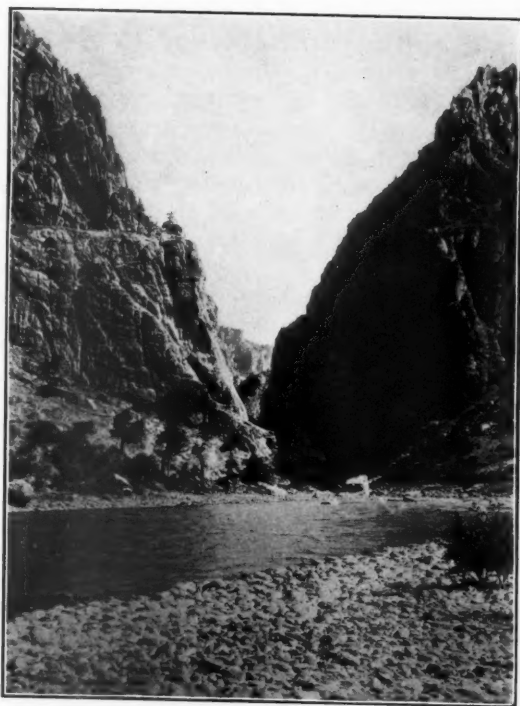


PLATE 5.—SHOSHONE CAÑON SITE FOR A DAM 310 FEET HIGH, WYOMING.



reservoir forty miles long, with a capacity of 2,000,000 acre-feet. As the estimated cost of this project is \$7,200,000, it is not probable that the construction of the principal works will be begun for a number of years. The sum of \$200,000, however, has been set aside, and authority has been granted for the early construction of the Leasburg Diversion dam and the enlargement of the Las Cruces Canal, a unit of the main project. Settlers in the valley have given guarantee to the Secretary of the Interior that they will repay this amount within two years after completion. These works are necessary to provide water for some 40,000 acres of land which, owing to the recent destruction of the old canal system, are now absolutely without water supply. It is believed that the construction of the entire project will bring about a settlement of the numerous controversies over water rights which have disturbed the relations of this country with Mexico, and which have continued for many years between the citizens of New Mexico and Texas.

Carlsbad Project.—The sum of \$600,000 has been appropriated for the purchase, extension, and enlargement of the present irrigation system on the Pecos River near Carlsbad. In October, 1904, a great flood swept away the Avalon dam and caused severe damage to the irrigation system. The owners, finding themselves unable to make the necessary repairs, made overtures to the Government to dispose of their holdings, and the owners of land in the valley contracted to repay the cost of the new works. Contracts are being advertised, and the work will begin as soon as the bids are awarded. About 15,000 acres are involved, all of which is in private ownership, much of it being under cultivation and in orchards.

Utah—Strawberry Valley Project.—This project embraces an area of about 50,000 acres of land in central Utah, situated from five to fifteen miles south of the town of Provo and on the eastern shore of Utah Lake. In its engineering features it is very similar to the Uncompahgre Valley project, as it involves the construction of a tunnel about four miles long passing under the divide and carrying the water from a reservoir in Strawberry Valley into the Spanish Fork River, from which a canal eighteen to twenty miles long will convey it to the irrigable area. Plans are approved, \$1,000,000 have been set aside from the fund, and actual construction will commence as soon as the weather conditions will permit.

Kansas—Garden City Project.—The first approved project of the Government which involves pumping is at Garden City, where water is to be lifted from a line of wells extending across the valley a total distance of 24,000 feet, to supply 15,000 acres of land just east of

Deerfield. The proposed plant is designed for the recovery of underground waters, and involves the construction of twenty-three pumping stations, each driven electrically from a central power station. The maximum daily capacity of the pumping plant for 150 days will be 150 second feet, and the mean daily capacity will be 100 second feet. The estimated cost of the project is \$237,000. Power will be developed from Colorado lignite costing \$3.50 per ton, in a pressure gas-plant, the power being distributed by direct current meters at the pumping station.

North Dakota Pumping Projects.—Four feasible pumping projects have been located in North Dakota in the semi-arid portion of the drainage basin of the Missouri River and its tributaries. Plans are well advanced on two of these, and it is expected that work will commence early this spring.

Williston Project.—Williston is located in the centre of this project, which provides for the irrigation of about 14,000 acres, the contemplated lifts to the several canals being approximately 40, 60, 80, and 100 feet.

Nesson Project.—Located on the north bank of the Missouri River, it includes an area of 20,000 acres.

Buford-Trenton Project, twenty miles west of Williston, covers a series of flats aggregating about 25,000 acres.

Bismarck Project, located just west of Bismarck, covers about 20,000 acres extending south along the Missouri River.

On these projects both steam and electric power will be used, which will be developed from lignite coals, immense quantities of which are found near-by in beds from an inch to 40 feet in thickness. The sum of \$1,000,000 has been allotted for initiating these works.

A résumé of the work performed by the Reclamation Service to date shows that 92 miles of main canal, 76 miles of distributing system, and 265 miles of ditches have been constructed, including dams, headworks, etc. Tunnels having a total length of 3 4-5 miles have been driven, including more than a mile of the great Gunnison tunnel. More than 265 miles of telephone lines have been installed and are in operation; 127 miles of wagon road, many miles of which were cut out of solid rock in almost inaccessible cañons, 150 bridges, and 80 office and other buildings have been constructed.

The works above mentioned have called for the excavation of 11,500,000 cubic yards of rock and earth, the laying of 70,256 cubic yards of concrete, 15,329 cubic yards of rip rap, 260,000 square feet of paving, 27,549 linear feet of sheet-piling, and 12,200 feet of bearing piles have been driven. There have been purchased 131,000

pounds of railroad iron, 265,000 pounds of structural steel, 959,000 pounds of cast iron, 2,163,000 feet B. M. of lumber, and 86,442 barrels of cement. The Government has erected a cement mill at a cost of more than \$100,000, which has already turned out 20,419 barrels of cement, and is now furnishing about 300 barrels a day. The saw mills operated have cut 2,889,000 feet B.M. of lumber from the Government reserves.

THE INTERDECENNIAL STATE CENSUSES.

BY

HENRY GANNETT.

Since the United States Census of 1900, fourteen States have made enumerations of population—namely, Michigan in 1904, and Florida, Iowa, Kansas, Massachusetts, Minnesota, New Jersey, New York, North Dakota, Oregon, Rhode Island, South Dakota, Wisconsin, and Wyoming in 1905. Reports on all of these have been made public with the exception of Florida and Oregon.

The following are the figures of population by these State censuses, with the increase since 1900 and the percentage of increase:

POPULATION BY CENSUSES, WITH INCREASE OR DECREASE.

STATE.	U. S. CENSUS, 1900.	STATE CENSUS, 1905.	INCREASE FROM 1900-05.	DECREASE FROM 1900-05.	PER CENT. OF INCREASE.
Iowa.....	2,231,835	2,210,337	....	21,498	....
Kansas.....	1,470,495	1,543,818	73,323	...	5
Massachusetts.....	2,805,346	2,998,958	193,612	....	7
Michigan.....	2,420,982	2,530,016*	109,034	....	4
Minnesota.....	1,751,394	1,979,912	228,518	....	13
New Jersey.....	1,883,669	2,144,143	260,474	....	14
New York.....	7,268,894	8,066,672	797,778	....	11
North Dakota.....	319,146	437,070	117,924	....	37
Rhode Island.....	428,556	480,082	51,526	....	14
South Dakota.....	401,570	455,269	53,699	....	13
Wisconsin.....	2,069,042	2,228,949	159,907	....	8
Wyoming.....	92,531	101,816	9,285	....	10

* Figures for 1904.

These States, taken together, contained, in even thousands, 23,144 in 1900, and 25,177 in 1905. In 1900 they contained 30 per cent. of the population of the continental United States. The average

rate of increase of all the States for the period was 9— per cent., the average rate per year being 1.7 per cent. The same States increased from 1890 to 1900 at an average annual rate of 1.95— per cent. The rate of increase has therefore been somewhat lowered—a result to have been expected. One State, Iowa, shows a slight decrease. All the others increased at rates ranging from 4 per cent. in the case of Michigan (for four years only) to 37 per cent in North Dakota.

The two most salient features of the foregoing table are the loss of population in Iowa and the great gain in North Dakota. Concerning Iowa, which has lost 1 per cent. in the last five years, although in the preceding five years (1895-1900) the State gained 8 per cent., a comparison by counties with the census of 1900 shows that losses were sustained by no fewer than seventy-eight out of ninety-nine counties, gains being recorded in only twenty-one. These twenty-one counties are widely scattered over the State. Certain of them are among the most populous, containing good-sized cities, to whose growth they owe their increase. Others are situated in the northwestern part of the State, and were sparsely populated in 1900. Still others owe their growth to railroad extension.

The cities and towns of Iowa have made good growth; it is in the rural districts that the State has sustained losses. While the State as a whole has lost 1 per cent. of its population, the rural population has diminished 5 per cent.; while all corporate places with a population of over 1,000 in 1905, taken collectively, have gained 9 per cent. Classifying the towns and cities and comparing the rate of growth of the different classes, it appears that the towns having a population between 1,000 and 10,000 increased 5 per cent., and that those between 10,000 and 100,000 increased at a much more rapid rate—*i. e.*, 14 per cent. In a general way, the larger the city the more rapidly it has increased. Of the third class, containing a population of over 100,000, this State has no representative.

This phenomenon which Iowa presents is not unusual, but is quite in accordance with the laws of population. It is almost purely an agricultural State. A little more than one-third of its inhabitants live in towns of 1,000 or more, and less than one-fifth live in towns of more than 5,000 population. The largest city has only 75,626 inhabitants, and there are but seven cities having between 25,000 and 50,000.

Taken as a whole, Iowa has reached the limit of agricultural density of population under present conditions. Her future growth will be due to manufactures and commerce, and until these are developed (their development being marked by the growth of her

cities) she cannot make progress. She is now in the condition in which Ohio and Indiana were twenty years ago; and, like them, she will resume growth as her manufactures develop. Vermont reached that stage half a century ago, but has never been able to apply the cure and recover from it.

The four years' growth of Michigan, 1900 to 1904, shows a rate of only 4 per cent., the rural population having increased only 1.5 per cent and the cities 8 per cent., the latter containing a little more than half the people of the State. The rate of increase for the six years 1894 to 1900 was 8 per cent., showing a considerable diminution during the last four years.

The rates of increase in the three groups of cities were respectively 8 per cent., 8 per cent., and 11 per cent., the latter being the rate of Detroit.

Wisconsin has increased in population 8 per cent.—a rate much greater than Michigan, and greater than the increase between 1895 and 1900, which was 7 per cent. Since it lies west of Michigan, its settlement commenced later, and has not progressed as far. Its density of population is also less. Its rural element increased 6 per cent., and its cities of over 1,000 inhabitants, which, taken collectively, constitute 44 per cent. of the population, increased 10 per cent. The three groups of cities increased respectively at the rates of 9 per cent., 12 per cent., and 10 per cent., the last being the rate of increase in Milwaukee.

Minnesota, lying still farther west, increased at a still more rapid rate—13 per cent. Its rate of growth from 1900 to 1905 was even more rapid than in the preceding five-year period, which was 11 per cent. The rural element, which constitutes 55 per cent. of the entire population, increased 8 per cent. between 1900 and 1905, and the cities 20 per cent.

The increase in the three groups of cities was respectively 15 per cent., 14 per cent., and 26 per cent., the last being the rate in the twin cities—St. Paul and Minneapolis.

South Dakota increased at the same rate as Minnesota, 13 per cent., a rate much less than that of the preceding five years—namely, 21 per cent. The rural population, which comprised four-fifths of the total population in 1905, increased 10 per cent, and the urban element 27 per cent.

Of all the States taking censuses, North Dakota had the most rapid growth, its per cent. of increase in the five years being not less than 37. No State census was taken in 1895, so that a direct comparison with the preceding five-year period cannot be made;

but in the decade 1890 to 1900 the State gained 71 per cent., showing that it just about held its great rate of increase. The rural element, which comprises about five-sixths of the whole population, gained at the rate of 35 per cent, and the urban element 45 per cent.

Kansas, which from 1895 to 1900 gained 10 per cent. in population, made a gain of only 5 per cent. between 1900 and 1905. This gain was entirely in the cities, which formed a little more than one-third of the population. They increased at the rate of 25 per cent.; while the rural districts lost nearly 10,000 inhabitants, or at the rate of 1 per cent.

The cities having population between 1,000 and 10,000 gained 21 per cent.; while those over 10,000 inhabitants gained 29 per cent.

For a frontier State, Wyoming is having very slow growth. Between 1890 and 1900 it added only 31,826 to its population, or at the rate of 49 per cent. Between 1900 and 1905 only 9,285 inhabitants were added, being at the rate of 10 per cent. for the five years, showing an astonishing diminution in the rate of increase. The rural population, which comprised about 55 per cent. of the inhabitants, increased only 2 per cent., and the urban element 22 per cent.

New York increased in the five years at the rate of 11 per cent. As there was no State census in 1895, this can only be compared with the decennial increase from 1890 to 1900, which was 21 per cent., showing the rate to be maintained. Practically all of this increase was in the cities and towns, since the rural population increased only 0.6 per cent, while the towns and cities of over 1,000 inhabitants gained 14 per cent. Here, as in Iowa—and, indeed, in all the States here considered—the increase was least in the small places and largest in the great cities. Classifying the towns and cities by population, as was done for Iowa, it appears that those between 1,000 and 10,000 increased 9 per cent., those between 10,000 and 100,000 gained 14 per cent., and those of 100,000 and over 15 per cent. In this State nearly four-fifths of the inhabitants are urban.

New Jersey showed a good rate of growth, 14 per cent.—slightly greater than in the five years from 1895 to 1900, which was 13 per cent. This growth was mainly in the cities and towns, which contain more than three-fourths of the entire population. The urban growth was at the rate of 16 per cent., and the rural element 7 per cent. only.

The three groups of cities grew respectively at the rate of 18 per cent., 18 per cent., and 13 per cent. The last group consists of the three cities of Paterson, Newark, and Jersey City.

Massachusetts increased only 7 per cent. between 1900 and 1905,

as compared with 12 per cent. in the preceding five-year period. In this State and in Rhode Island it is impossible to separate the urban and rural elements, since both may be present in each town, which is the smallest unit by which the population is given.

Rhode Island made the notable increase of 14 per cent., which may be compared with the increase in the preceding five years (1895 to 1900) of 11 per cent.

Taken collectively, the rural population of nine States, omitting Massachusetts and Rhode Island, shows an increase of only 3 per cent. The urban population, classified according to the size of the cities and towns, shows the following rates of increase:

1,000 to 10,000.....	13 per cent.
10,000 to 100,000.....	14 per cent.
100,000 and over	15 per cent.

The average rate of increase in the urban population is 14 per cent.

PRECISE LEVELS IN THE UNITED STATES.

In the past five years and since the adoption of an improved binocular precise level by the U. S. Coast and Geodetic Survey, and because of the vast amount of primary levelling now being run in accordance with the law by the U. S. Geological Survey, rapid strides have been made in the extension of precise levels over the United States. A few years ago we had in the United States lines of precise level by the Army Engineers up the Mississippi River to St. Louis, up the Hudson River, through the Great Lakes and down the Mississippi to St. Louis, and the transcontinental line of the Coast Survey from Sandy Hook to St. Louis.

Since the introduction of the new Coast Survey prismatic level, which has recently been adopted in the Geological Survey also, because of the rapidity and cheapness with which precise levelling of a high order can be run by this instrument, greater progress has been made in determining exact altitudes within the interior of the continent in the past few years than in all the preceding years.

The Coast Survey had, a year ago, extended its transcontinental line from Denver to Grainger, Wyo. It had run a line of precise levels along the 98th meridian from its transcontinental line southward to Fort Worth, where it connected with lines of the Army Engineers down the Red River to New Orleans.

Precise levels of the Coast Survey had been run from the neighbourhood of Mobile Bay *via* Chattanooga and Cincinnati to Toledo, where connection was made with the Army Engineers' levels in the Great Lakes. The Engineer Corps of the Army had run their routes of levels from the Mississippi up the Arkansas River to Fort Smith, and thence to Kansas City, connecting there with their levels up the Missouri River to Sioux City.

The Geological Survey had run precise levels from Newbern, N. C., *via* Knoxville and Atlanta to Brunswick, Ga., connecting at Chattanooga with the Coast Survey levels; also, through various portions of New York, Ohio, and especially along the Pacific Coast from San Francisco through the San Joaquin Valley to Los Angeles and through the Sacramento Valley to Portland; also from Seattle, eastward into Montana.

Last year the Coast Survey completed the extension of its precise levels from Grainger to Seattle. The result of this vast transcontinental chain from Sandy Hook, checked by numerous lines at St. Louis and farther out at Kansas City, Sioux City, and Denver, and reaching in a single line from Cheyenne to Seattle, gives a check between the two oceans of seven inches.

During the field season just closed the Coast Survey has extended its precise levels along the 98th meridian northward from Sioux City to the neighbourhood of Fargo, N. D., and is continuing the same down the Red River toward the Canadian boundary. The connection eastward from the neighbourhood of Fargo to the Army Engineers' levels at Duluth, on Lake Superior, is soon to be made.

The Geological Survey ran lines of precise levels during the past season crossing Iowa from near Council Bluffs to Des Moines; also, across Illinois from near Pekin, where connection was made with the Army Engineers' levels, to Champaign; in Ohio, from Chillicothe northward to Columbus; in Virginia and North Carolina, from near Raleigh northward to the Roanoke River; also from Greensboro northward to Roanoke, Va.

From the above it will be seen that elevations of precision, the heights of which will doubtless remain for many years, have been procured throughout nearly the whole eastern portion of the United States. In addition, primary levels of less accuracy, but still of comparatively high value, have been run throughout many portions of every State in connection with the topographic mapping of the U. S. Geological Survey. In connection with these primary levels, permanent bench-marks of metal have been set at distances averaging three miles apart wherever the levels have been run.

In the western part of the United States a large amount of precise levelling has also been done. In addition to the transcontinental line of the Coast Survey and the line of the Geological Survey from Oregon to southern California, spur lines have been run into north-eastern Washington, northern Idaho, and Montana. In addition there are many disconnected lines of precise levels in Arizona, New Mexico and Montana, Utah, etc., which, it is expected, will be connected by extensions to be run within the next few years, thus reducing them accurately to mean sea-level.

In connection with some short lines of precise levels which were run the past season in southern California by the Geological Survey, some unlooked-for discrepancies were found between the elevations determined on the lines of precise levels run several years ago by the Geologic Survey from San Francisco Bay *via* Bakersfield, which is at the head of the San Joaquin Valley, to Los Angeles. The levels of the past season between Bakersfield and Caliente failed to check with a number of the bench-marks of the old precise levels by amounts of from eight inches to one foot. As both lines of level were of a high order, a number of these bench-marks were re-checked, with similar errors. The only possible way in which these peculiar discrepancies can be accounted for is on the assumption that the elevations of the region have been changed by an earthquake which occurred a few years ago.

The Geological Survey also ran a line of precise levels from Yuma, on the lower Colorado River, eastward about 200 miles to Tucson. In New Mexico a line of precise levels was run from Albuquerque northward up the Rio Puerco to the Colorado line, a distance of about 175 miles. Another line of precise levels is being extended southward from Albuquerque down the Rio Grande, a distance of about 300 miles to El Paso. A line of precise levels was also run from Harvey, on the Santa Fé Railway, northward to Owens Lake, and a check line from this was run westward to the summit of Mt. Whitney, in California. This line is now being extended eastward into Death Valley, California, and into the Amargosa desert, and its results are awaited with interest, as they will definitely determine its exact depth below sea-level. So far as indicated, the lowest point of this valley is 450 feet below sea-level, and is probably the lowest piece of dry land on the earth—that is, it is the lowest depression in which no water-body exists.

In Alaska material progress was made in the extension of detailed topographic mapping in connection with the studies of the economic mineral resources. The larger portion of the season's

work was devoted to large-scale work, which will permit of more exhaustive investigation of the economic geology. The earlier reconnaissance scale of about four miles to the inch has been practically discontinued for surveys in Alaska, as the more important regions have now been covered by such surveys. A little of this work was done, and less of it will probably be executed in the future as the whole of the general physiography of Alaska is developed.

One topographic party, accompanied by a geologist, made a reconnaissance survey of an extensive area of country along the Beaver Dam River, the resulting maps being on the scale of four miles to one inch, with a contour interval of 200 feet. Another party mapped about 400 square miles at the mouth of Copper River, on the scale of one mile to one inch. Another party mapped quite an area about Solomon, on Seward Peninsula, on the scale of one mile to one inch.

One of the results of the season's work, covering as it does with those of previous years the mapping of a large portion of Alaska, has been a careful revision of the area of Alaska. This is now found to be about 586,000 square miles, or about 4,000 square miles less than has heretofore been accepted.

GEOGRAPHICAL RECORD.

AFRICA.

THE DUKE OF THE ABRUZZI GOING TO RUWENZORI.—The *Bollettino* of the Italian Geographical Society (March, 1906) says that the Duke of the Abruzzi, with an expedition, will leave Italy in April for the Ruwenzori range in Africa, which he hopes to explore. He will be accompanied by Captain Cagni, Dr. Cavalli, naval Lieutenant Winspeare, Vittorio Sella, the renowned Alpinist and photographer, Mr. Botta, and the guides Fenouillet and son and Ollier. The party will proceed to Mombasa, where a caravan of 250 native porters will be formed to accompany the expedition to the Ruwenzori range. The expedition will reach Victoria Nyanza by the Uganda Railroad, and from the lake will travel on foot to the mountains. Here the Italian members of the party will leave the natives, who are not familiar with mountain regions and could scarcely endure the cold of the upper altitudes. After ascending the range and completing their explorations the European members of the expedition will probably go north to Albert Nyanza and descend the Nile to the Mediterranean. It is expected that the work will require about six months.

MR. FRESHFIELD'S ATTEMPT TO ASCEND RUWENZORI.—Mr. Douglas Freshfield, accompanied by Mr. Mumm, went to the Ruwenzori range last fall to attempt the ascent of these snow mountains. November was unfortunately very un-

favourable for mountain-climbing and exploration. Mr. Freshfield says in his paper on this journey (*Alpine Journal*, Feb., 1906) that he was told by whites and natives in the neighbourhood that January and July are the only fine-weather months on the mountains. His attempted ascent was made from the Mubuku Valley, which is the easiest, and perhaps the only, route from the east to the highest part of the range. Rain was almost incessant, and the climb of 8,000 or 9,000 feet to the head of the Mubuku Valley was through a succession of morasses, precipitous mud-slides, and barricades of fallen trees. The earlier explorers on this route were stopped by a rock-face calling for the use of a rope. Mr. Freshfield's party, however, soon mastered this obstacle; but above it they were compelled to take to the glacier, and, after step-cutting for about an hour, found themselves on the verge of the uncrevassed upper slopes which led to the gap south of the highest peak. From distant views and photographs obtained of this upper region, Mr. Freshfield feels confident that there would be little difficulty for practised climbers above this point. A height of 14,500 feet was attained, when dense fog descended, and after twenty-four hours without change in the weather, the party retreated to the lower valley.

Mr. Freshfield says the highest summit is not, as has been supposed, the bold rock peak conspicuous from the upper Mubuku Valley, but a snowy summit more to the north. He thinks the highest point of the range does not exceed 18,000 feet, and that the extent of the snowy range has been exaggerated. He believes a circle twelve miles in diameter would include all the glaciers. Trees grow up to an elevation of 15,000 feet. He found the mountain tribes, the Bakonjo, to be excellent porters. They carried heavy burdens up the worst paths with skill and alacrity, and were willing, helpful, and intelligent. They can climb rocks, but they have had no experience with snow and ice.

STUDIES IN THE WESTERN SAHARA.—The French, early last year, investigated a large area in the Sahara west of the Tuat oases to about $6^{\circ} 50'$ W. only 112 miles from Tenduf, a former important centre of the slave trade but abandoned since 1903. The *Renseignements Coloniaux*, published by the Comité de l'Afrique française (1905, Nos. X *bis* and XII *bis*), contain a detailed account of this journey, which was made by Captain Flye Sainte-Marie and a small party. The route led through Igidi, a region of extensive sand-dunes, which had been invaded by marauding bands from the southern borderlands of Morocco. The object of the expedition was to cross the principal caravan routes extending north and south and to study the present political and economic position of this part of the desert with a view to future operations.

It was found that six caravan routes from Morocco cross this region to the Sudan, all of them uniting at Taodeni, to the north of Timbuktu. Three of the roads start from the Tafilet oasis, two from the Wadi Draa, and one, which was Dr. Lenz's route across the Sahara, from Tenduf. Five of the routes pass through three districts of Igidi which have pasturage and other advantages and lie within a zone only 170 miles in width. The command of these three districts will virtually control the whole of the caravan trade in the western Sahara. There is now very little trade, and not a human being was met during the journey of 1,200 miles. But Captain Flye Sainte-Marie believes that as soon as Igidi is protected from Moroccan robber bands these trade routes will again be utilized.

COLONISTS IN GERMAN EAST AFRICA.—*Der Tropenpflanzer* (March, 1906) prints a long circular issued by the Government of German East Africa, con-

taining detailed information for the use of white colonists who desire to settle in the Kilimanjaro province. The Government says that colonists will enter this undeveloped field upon their own responsibility, and must expect to face privations common to pioneer life in new countries. But nature there is fairly bounteous, and although the prospect of acquiring large means is very slight, the diligent man may make a home for himself and become independent. The colonist should have a capital of at least \$2,000, and married men are most desired. Most of the province consists of grassy steppe, with large and small areas of forest in the north near the mountains. The native population at the foot of Kilimanjaro is so large that European settlers can acquire very little acreage among them. The soil is generally fertile, but the settler should take only such land as has perennial running water. Allotments of land may be secured by lease at a cost of only a few cents per acre. As soon as the settler has one-tenth of his holding under cultivation or otherwise usefully employed, he will be entitled to purchase twice as much land as he has improved at one to two rupees a hectare. The circular intimates that good labour may be obtained among the natives, who, if well treated, will work faithfully for three rupees (75 cents) a month. The chief industries must be general agriculture and stock-raising. All the information needed by immigrants is found in the circular. This region is only about 200 miles south of the Equator, but its high elevation mitigates the tropical heat.

ONE OF THE HIGH PLATEAUX OF BRITISH EAST AFRICA.—Major A. St. Hill Gibbons recently read a paper before the Royal Geographical Society (*The Geog. Jour.*, March, 1906) on his study of the Guas Ngishu plateau in East Africa, in the early part of 1905, with a view to ascertaining its adaptability for European agricultural settlement. The information he and his colleague, Mr. Kaiser, obtained makes an important addition to our knowledge of this plateau, most of which stands 6,000 feet above sea-level. This is the western part of the high plateau region of British East Africa. He found nothing in the temperature of the Guas Ngishu to prejudice its colonization prospects. He believes that this, as well as other higher altitudes of this part of Africa, will be numbered among the admittedly healthy countries of the world, and that they will have considerable agricultural development. He found that the streams on the plateau flow so rapidly as to deprive the mosquito of his natural breeding conditions. There is almost total absence, also, of the rank river vegetation which this insect loves so well. The natural health conditions are excellent, and the disease-bearing mosquito and flies are absent. The soil in the valleys and lower-lying lands is excellent for agricultural purposes, but the country seems to be best fitted for cattle-raising and forest products. The plateau can support as many cattle as any similar area in Africa.

PROFESSOR KOCH ON THE SLEEPING SICKNESS.—Professor Koch is about to start on a second expedition to the northern coast of Victoria Nyanza for the purpose of making further studies of the *glossina palpalis*, the fly by which the infection of the sleeping sickness is conveyed to human beings, and of the possibility of prophylactic measures against the infection. He found on his first visit that the fly is on all the coasts of the Victoria Nyanza, although the sleeping sickness is chiefly confined to the northern coast.

AMERICA.

PHYSIOGRAPHY OF THE TACONIC MOUNTAINS.—In a recent *Bulletin* of the United States Geological Survey (No. 272, 1905), Professor T. Nelson Dale

presents a rather full description and discussion of the physiography of a part of the Taconic Mountains in Western Massachusetts and Southern Vermont, illustrated by a number of excellent half-tones and sections from topographic maps. The history of the region is briefly as follows: First there was an accumulation in a broad arm of the ocean of a series of sediments which, together with a crystalline basement, were later thrown into a series of parallel folds, diminishing in altitude from east to west. There were three periods of folding: one at the close of the lower Cambrian; the second, more extensive, at the close of the Ordovician; and the third either in Devonian or Carboniferous time. Both faulting and metamorphism accompanied this folding. A long period of denudation reduced the series to great longitudinal ridges and valleys, and in some places stripped off the sediments, revealing the crystalline rocks of the ancient sea-floor. The last phase in the modification of the topography was that caused by the glacial invasion.

The effect of denudation on this mountain complex has been to introduce three prominent topographic types. The first of these, called the plateau type, includes the Green Mountain range, with its gently-undulating or roundish surfaces with few and usually not rugged elevations, but with its flank deeply incised. The Rensselaer plateau, a small westerly-inclined peneplain, is also classed with the plateau type.

The second type, called the Taconic, consists of alternating ridges and valleys, the ridges being cut by transverse and diagonal valleys, and sometimes intricately dissected.

The third type, the Hudson-Champlain, is less marked in character, consisting of minor, irregular elevations and depressions, but with a series of isolated hills reaching to nearly 700 feet above the general surface.

The plateau type is the result of the toughness of the crystalline rock, in which the effect of structure is of minor importance, the whole mass offering essentially uniform resistance to erosion. The ridge and valley (Taconic) type reflects the influence of variable degrees of resistance in the underlying rocks. This difference in rock structure also affects the vegetation, for the limestone of the valleys, even when covered with drift, possesses a more fertile soil than the schist areas. The latter, moreover, since they constitute the hill tops, are more rugged, bear less drift, and are prevailingly forest-covered, while the limestone valleys are more commonly cleared and tilled.

R. S. T.

MARYLAND'S MAGNETIC SURVEY.—Volume V of the Maryland Geological Survey (1905) contains the second Report by Dr. L. A. Bauer on magnetic work in Maryland, summarizing all the results obtained thus far. The general field work has now been brought to a close. The operations hereafter will consist, on the part of the Coast and Geodetic Survey, in the reoccupying of certain stations known as "repeat stations," for the purpose of ascertaining the amount of annual change of the magnetic elements. With the aid of these results the magnetic maps of Maryland can always be brought up to date. The future work on the part of the State will consist in the delineation of the disturbed areas and the correlation of the magnetic disturbances with the geological formations. Dr. Bauer says that Maryland now possesses the most detailed magnetic survey of any country, with the exception of Holland. The magnetic survey of that kingdom embraces, on an average, one station to every forty square miles; that of Maryland, one to every 100 square miles; that of England, one to 139 square miles; and that of Missouri, one to every 438 square miles. In this list New

Jersey is not given, since only declinations were observed. The Report abounds with tabular statements of the results of the magnetic work to date. Maps of lines of equal declination, inclination, and horizontal intensity for Maryland, Delaware, and the District of Columbia are presented.

GROWTH OF SAND REEFS ALONG THE NORTH CAROLINA COAST.—Prof. Collier Cobb, of the University of North Carolina, has reprinted from the *Journal of the Mitchell Society* (Vol. XXII, No. 1) the "Notes on the Geology of Currituck Banks" which he wrote in the summer of 1904, when he made a careful examination of these banks from the Virginia line to Kittyhawk Bay and the Kill Devil Hills. The sand-reefs or banks along the North Carolina coast have grown steadily in length from the time of the earliest settlements, until there is now no inlet from Cape Henry to Oregon Inlet. The inlets through the Currituck Banks have been closed up by the steady southward march of the great barchanes or *médanos*, crescentic sand-dunes, known locally as whaleheads. These dunes are composed of singularly homogeneous blown sands, the horns or cusps of the barchanes pointing to leeward, which is almost due south:

Following the ocean side of Currituck Banks, one may often see a distinct terrace marking the line between the Columbia sands and the Neocene clays; on stormy days comminuted Tertiary shells are washed up, and quite frequently after a storm one may pick up water-worn shells of *Cardium*, *Anomia*, and *Exogyra*, of which I brought away a score of specimens. These are distinctly Cretaceous forms. The facts go to show that the Banks are not of such recent origin as is usually supposed, but are of the same age geologically as the adjacent mainland.

On the Atlantic side of this Currituck Bank I found numerous pebbles, some as much as three to four inches in diameter, buried in the upper sands and muds, some well rounded, others sub-angular, and some of these latter even striated. These pebbles are, almost without exception, unlike any of the stone of the mainland of North Carolina; and both their position and individual characters point to their glacial origin. It is clear that they are the work of the ice-sheet of the last glacial period, drifted southward by icebergs which stranded on the Carolina coast.

A rather rapid subsidence of the coast is now in progress; the blown sands and the silt, arrested by aquatic vegetation, are rapidly filling in the sound side of the Banks, and the water of the Currituck Sound has already become fresh since it has been cut off from direct communication with the sea, the inflowing streams having leached out the salt.

The Great Whaleshead barchane opposite Church's Island has moved southward three-quarters of a mile in twenty years, and the closing up of the sound has been so rapid as to bring about litigation in the courts for the possession of the new-made land. The subsidence of the land is so easily seen from beacons and telegraph poles as to be a matter of remark among the least observant of the inhabitants.

IMPROVING ROADS IN INDIANA.—State Geologist Blatchley, of Indiana, informs us that, during the past year, several of his assistants have continued the investigation of the road materials of Indiana. This work has been in progress for two or three years, and will form the main feature of the report for 1905. Every county in the State has been visited, and a study made of the available materials for improving roads. These are of two general classes—gravels and limestones. The gravels are much more widely distributed, and, in general, more available than the limestones. They are for the most part drift gravels, though many of them have been assorted and redeposited a number of times by streams.

In the southern third of the State are numerous deposits of gravel derived from the decay of the country rock. Those from the Knobstone or Waverly formation are mostly of iron carbonate, and roads constructed from them have proved very durable and smooth. The same is true of the gravels from the Harrodsburgh (Keokuk) limestone, which are largely composed of geodes and other fragments.

Six or seven different limestones are available in the southern half of the State for macadam purposes. In the northern half these are almost everywhere too deeply covered with drift. About sixty samples of limestone from various

parts of the State have been sent to the U. S. Testing Laboratory at Washington, and the results of the tests will be incorporated in the report.

THE COURSE OF THE TENNESSEE RIVER.—The remarkable course of the Tennessee River, which leaves the broad, open Appalachian valley of Tennessee to cross the Walden Ridge near Chattanooga, has attracted the attention of physiographers, and has been the subject of several articles. Hayes and Campbell have proposed as explanation of the peculiar river course that the Tennessee was diverted from the old Appalachian valley by headwater capture and led across the Walden Ridge. Recently C. H. White (*Jour. Geol.*, Vol. XII, 1904, pp. 34-39) has stated objections to this theory, and D. W. Johnson, more recently still (*Jour. Geol.*, Vol. XIII, 1905, pp. 194-231), has brought forward facts which are opposed to it. Among the points made by Johnson are the following: The gorge across the Walden Ridge is winding, and its course is more in harmony with the theory of inherited meanders of a former period of base-levelling than with headwater capture. The Walden Ridge is breached in only this one place, whereas if headwater erosion had been in progress sufficiently to divert the Tennessee it would be expected that other small streams would have eaten backward far into the ridge. The divide south of Chattanooga has a form quite out of harmony with the theory of a former course of a large river across it. The stream which is supposed to have captured the Tennessee was tributary to a smaller stream than the Tennessee, and therefore, on the theory of capture, it must be supposed that a small river was able to capture a much larger one, which does not seem probable. The presence of gravels along the Tennessee and their absence in the Appalachian valley to the south is also opposed to the theory of Hayes and Campbell. Altogether, Johnson makes out a strong case in favour of the alternate theory, which White previously supported, that the course of the Tennessee is simply inherited from that of a former lowland state, and is not the result of river capture. R. S. T.

PROTECTING RUINS IN THE SOUTHWEST.—A bill is now before Congress the aim of which is to preserve the historic and prehistoric ruins of Arizona, New Mexico, Colorado, and Utah. Two years ago, Mr. Edgar L. Hewett wrote a report* on these ruins and their preservation in which he dealt at length with their distribution. He showed that the habitat of the prehistoric tribes of the southwest had been determined by the drainage systems, the great basins of the Rio Grande, the San Juan, the Little Colorado, and the Gila constituting the four seats of prehistoric culture of the so-called pueblo region. The remains of this ancient culture are of the three types—pueblo ruins, cliff houses, and cave dwellings. His map showed the most important ruins in the pueblo region. The information collated by Mr. Hewett is the basis of the proposed law for the preservation of the remains. It is well known that in recent years an extensive traffic has arisen in relics from these ruins, and, in securing relics, buildings, mounds, and other objects have been destroyed. These relics are priceless when secured by proper scientific methods, but of comparatively little value when scattered about in museums or private collections without accompanying records.

CORRECTION.—Dr. E. O. Hovey writes on the 29th of March:

In lines 4 and 5 of "Geographical Notes on the Western Sierra Madre of Chihuahua, Mexico," page 84 of BULLETIN, Vol. 38, No. 2, *south* should read *north* and *north* should read *south*. This error must have been in the copy, but I cannot understand how I failed to see it.

* Circular relating to Historic and Prehistoric Ruins of the Southwest and their Preservation. General Land Office, Washington, 1904.

ASIA.

AMERICAN TRAVELLERS IN CENTRAL ASIA.—Prof. W. M. Davis sends us the following extracts from letters lately received from two of his former students, now exploring the desert regions of Central Asia. The first part of their journey was made together. In the later months they have been travelling independently:

FROM MR. BARRETT.

DALAI KOURGAN, NEAR

KARA MUREN RIVER, CHINESE TURKESTAN, Dec. 16, 1905.

Our regular work began when we left Srinagar last spring, travelling by the trade route to Leh. From there we crossed the Chang La (pass) and went up the Shyok to the main route over the Karakoram, which we followed nearly to Suzet Pass. Here we diverged somewhat to the east, and crossed an easier pass by the smaller trail which led down to the Karakash. We then tried the Hindu tash pass to the north, but, failing there because of the very deep snow, descended the Karakash to the main trade route. We crossed the Sand-ju pass and descended a river and entered a district of the same name. We examined a number of valleys on our further way to Khotan. From there we went on to Nura by an easy trail between the Karakash and the Yurungkash. We examined the country very critically from Nura to the Kara-tash and from the head to the mouth of that river. Here Huntington and I parted company, and I went on by the trade route to Kiriya. Later I returned to the Kara-tash and did more work there and in a neighboring valley. After a second visit to Kiriya, I went to the ruined villages that Stein had seen, and thence eastward to Moldja and to my present stopping place.

From here I am planning to go eastward, with various side trips, and later on shall reach Lan Tchou, in the province of Kan-Su, by the southern trade route. . . .

R. L. BARRETT.

FROM MR. HUNTINGTON.

CHERCHEN, CHINESE TURKESTAN,

Nov. 27, 1906.

. . . We are going to rest in this village of a thousand inhabitants for about a week. I am comfortably lodged in a cavernous chamber lighted by an eighteen inch hole in the roof and heated by a mud fireplace six inches wide and three feet high. It is really very comfortable here, compared with the fire in the sand, by which I slept a few nights ago, when I failed to find the caravan on returning from a trip along a belt of dying-out jungle, where I had ventured too far. The days are still bright and warm, 50° to 60° F.; the nights are cold, from 15° to 25°. Great preparations are in progress here for the feast of Bairam at the end of a month of fasting. . . .

The six weeks since I last wrote have been the very best of the whole journey. The evidence of old towns and of areas of dead vegetation seems to prove almost conclusively that there has been a steady desiccation of the Tarim basin throughout historical times. Evidence is also accumulating regarding the relation of the river courses, especially where they change from centripetal to peripheral courses, to the former shore lines of Lop Nor. . . . My men are a fine lot. They are as keen as I am in looking for old cities or rivers. Now one and now another comes with some story of a ruin which he has learned from the natives. I have five men, five camels, and eight horses; that may seem large, but I think it is the smallest caravan with which any explorer has ever come into this region. A good-sized caravan is a necessity, for one must be able not only to carry supplies for two or three months, but to run the caravan in two independent sections. During the last forty days the only people we have seen were a few shepherds. Most of this time I have been away from the main party, usually with two men and three camels, besides a local guide, looking for the ends of rivers far out in the sands. . . .

ELLSWORTH HUNTINGTON.

TOPOGRAPHY AND RAINFALL IN INDIA.—In a paper on "Some Geographical Peculiarities of the Indian Peninsula" (*Scot. Geogr. Mag.*, 1905, p. 459) the author, Cameron Morrison, points out that the position of the Western Ghats so near the windward coast of India has deprived the interior of much of the rainfall that would otherwise come to it. Most of the rainfall (over 100 inches in the year, on an average) flows down the western slopes into the sea, and is practically lost to agriculture except on a narrow strip along the coast. An interesting case of man's interference with nature in such matters is the successful attempt of the Madras Government to divert water from the western to the eastern slopes of the Western Ghats. At great expense one of the west-

flowing streams has been dammed, and, by means of a tunnel cut back through the hills to the east, the waters are led over to the eastern slopes of the mountains, and serve to irrigate a large tract on their leeward side. Thus, by man's skill, the heavy rainfall on the windward side becomes available on the leeward side, where the presence of the mountains has produced a deficient precipitation.

R. DEC. W.

THE PRESSURE AND RAINFALL CONDITIONS OF THE TRADES-MOONSON AREA.—

In 1900, Mr. W. L. Dallas, of the Meteorological Department of India, discussed the seven monsoon seasons of 1893 to 1899. He showed that (1) the monsoon rainfall was deficient during the rising portions of a series of oscillations of pressure which occurred during these seven years, and in excess during the falling portions, the amount of rainfall variation agreeing directly with the rapidity of the pressure changes, and (2) that the pressure oscillations showed a periodicity of about four years. Lately, Mr. Dallas has carried his discussion further, in order to determine over what area the pressure oscillations extended, how they agreed in amplitude and in time throughout the affected area, and what relation the rainfall of the whole monsoon area bore to the pressure oscillations. The conclusions tentatively reached are as follows: (1) Four-year oscillations of pressure occur over the trades-monsoon area, most markedly over the equatorial belt. (2) During the rising portions of these oscillations the general rainfall of the trades-monsoon area is below, and during the falling portions is above, the average. There is a well-marked minimum of rainfall in the first year of the cycle, and a well-marked maximum in the third year. (3) At irregular intervals rays or streamers of varying extent and intensity emanate from the Antarctic or extreme southern regions, and these cause increased pressure over the affected area. (4) The rays or streamers affect large areas practically simultaneously, continue for considerable periods, and are apparently not in the least of the nature of waves. (5) When extensive, as in 1899 and 1900, the pressure is above normal, and exhibits large oscillations. When absent, as in parts of 1898-1899, the pressure is low and the oscillations are small. (6) These variations are superposed on the four-year cycle above mentioned, and are spasmodic, producing irregular variations of rainfall and irregularities in the pressure cycles. Satisfactory explanation of the four-year pressure cycle and of these irregular pressure disturbances has not been found as yet. The variations of pressure cannot be the result of variations of rainfall, for these variations are as marked in a dry as in a wet area, and the variations in pressure precede the variations of rainfall.—(*Proc. Amer. Philos. Soc.*, XLIV, 1905.)

The interest which attaches to any such study of periodicity is peculiarly great in a region like India, where so much depends upon the time of occurrence, the distribution, and the amount of the monsoon rains. In India, as is well known, long-range forecasts, based upon thoroughly sound scientific principles, are regularly made in the case of the monsoon rains. Any light which can be thrown upon the controls of these rains will be of benefit to millions of people in that populous country, for the Indian meteorologists will at once use this knowledge in making their seasonal forecasts.

R. DEC. W.

CLIMATE AND HEALTH IN THE PHILIPPINES.—A valuable investigation of the mortality statistics for the Philippine Islands, by Henry Gannett, occupies the greater part of Vol. III of the *Census of the Philippine Islands*, taken under the direction of the Philippine Commission in 1903 (Washington, 1905). With

the increasing interest on the part of Americans in tropical hygiene, more and more attention will be paid to the study of the diseases of our tropical possessions and of their relation to weather and climate. The normal death-rate is given as 31.7, which is 82% greater than that of the United States (17.4 per thousand). It must be remembered, however, whenever tropical death-rates are under discussion, that the lack of proper sanitary precautions among tropical natives is usually sufficient cause for a much higher rate than that found in highly-civilized countries, where so much attention is paid to hygiene. Many other controls also affect the Philippine death-rate, as, for example, in the year 1902, when it was 63.3 per thousand, or just about double the normal. This excess, we are informed, was largely due to the prevalence of cholera, but other factors to be considered were the loss of crops through locusts, the loss of carabao, and the after-effects of the insurrection, which resulted in lowering the vitality of the natives through hardship, exposure, and want of food. At one time, when the United States first obtained control of the Philippines, it was officially stated, in a Government publication, that the death-rate among the American troops in the Philippines was no larger than the death-rate in an ordinary American city. The inevitable result of such a statement was the conclusion, on the part of our public, that residence in the Philippines, so far as general climatic conditions are concerned, was not attended by any higher death-rate than life in one of our cities. It was not apparent to the general public that it is absolutely illogical to draw any such conclusion from a comparison between the death-rate of American men, in the prime of life, selected for service in the Philippines, and many of them invalidated home before they died, with the death-rate in an American city, based on the returns of deaths of all ages, of both sexes, and from all causes. It is, therefore, with especial care that the statement on pages 26-27 of this volume should be read:

The death-rate of whites was 32 per thousand (1902). This, though only one-half of the death-rate of the brown people, must still be regarded as large, inasmuch as the white people in the islands are almost entirely adults in the prime of life; that is, in the class which commonly has the minimum death-rate. In the United States the death-rate of this class is much less than the above figure; and while probably the death-rate of the whites under Philippine conditions is greater than in their native country, it can scarcely be increased to this extent, especially since the sick are usually removed to the States or to Japan, if possible.

From a meteorological point of view, a series of diagrams showing the proportion of deaths from the various diseases by months is of especial interest. In 1902 the smallest number of deaths in any month was in February, from which time the number increased rapidly up to September, and then decreased. The smallest proportion of deaths occurred in the cool season (24.5%); 28.4% occurred in the warm season, and 47.1% in the wet season. As is the general rule, for the tropics as a whole, malaria, dysentery, and diarrhoeal diseases cause a large proportion of all deaths. In the United States, on the other hand, deaths from the well-known "Temperate Zone" diseases—pneumonia, heart disease, and typhoid fever—are much more common than in the Philippines. Tuberculosis was the fourth disease in fatality in the Philippines in 1902. In the United States it is commonly the most fatal of all diseases. In the year 1902, deaths from cholera were at a maximum in September; from beri-beri in the wet season (August to October); from diseases of the stomach in the warm and wet seasons (April to September); from smallpox, in March, April and May (warm season). Tuberculosis showed little relation to weather. Bronchitis is least common in the cool season. Dysentery shows a distinct maximum in July, August, and Septem-

ber. More than half the deaths from this disease occurred in the wet season. From diarrhœa the deaths in the wet season were two-thirds greater than in the warm season, and two and a half times as great as in the cool season. It is a rather striking fact that the number of deaths from malaria was about the same during the cool months as during the warm months.

R. DEC. W.

EUROPE.

THE NEW MAP OF FRANCE ON A SCALE OF 1:50,000.—The Commission centrale des travaux géographiques voted in 1898 to produce a new map of France on a scale of 1:50,000, or 0.7 statute mile to an inch, in colours, to be based upon resurveys on a scale of 1:10,000 and 1:20,000. It was decided that these surveys should not be reserved for the exclusive use of the army, but should be made also for the purpose of meeting the needs of science and industry. The topographic resurvey was begun in 1903. The Geographical Service now has the topographic surveys required for the publication of thirty-two sheets of the map on the scale of 1:50,000. Nine of these sheets, representing Paris and its environment, have been presented to the Chamber of Deputies, in the hope that the utility of the work will be appreciated and the necessary credit for carrying it out voted.—(Condensed from the *Bulletin de la Société de Topographie de France*, Dec., 1905.)

SHORTENING THE ROUTE BETWEEN ST. PETERSBURG AND THE SIBERIAN RAIL ROAD.—The new railroad between St. Petersburg and Vologda has been completed. The line from Vologda to Viatka is now building, and the construction of the direct line from Perm to Cheliabinsk has begun. These roads will make a shorter route between St. Petersburg and the Siberian railroad at Cheliabinsk, and will stimulate the export of Siberian grain by way of St. Petersburg. According to the *Board of Trade Journal*, the distance between St. Petersburg and Cheliabinsk will be 226 miles shorter than by the present route *via* Moscow. It will mean twelve hours saved for passenger traffic and over twenty-four hours for freight and a cheapening of freight rates of from 17 to 7 kopecks per pood. The shorter route will somewhat change the conditions of the Siberian export trade, and butter and game are likely to be despatched to St. Petersburg and Revel instead of, as now, to Riga and Libau.

POLAR.

MR. WELLMAN'S ARCTIC POLAR PROJECT.—Mr. Godard, of Paris, is building an airship for Mr. Walter Wellman, in which he will try to reach the North Pole. The expenses will be paid by the *Chicago Record-Herald*, of which Mr. Wellman is the Washington correspondent. The airship, which will be 164 feet long, 53 feet in its greatest diameter, and with a lifting power of 16,000 pounds, will carry five men, food for them for seventy-five days, motor boats, sledges, tools, etc., and 5,500 pounds of gasoline for the motors. The balloon will consist of three thicknesses of fabrics with three coatings of rubber, and, according to experts, it will approximate closely to gas tightness, though no means have as yet been found of making with fabrics an absolutely gas-tight reservoir. The outer rubber coating will be perfectly smooth, with nothing to hold moisture, snow, or frost. The motive power, composed of two motors driving two screws, will give speed of twelve to nineteen statute miles an hour. The men will have a comfortable car to live in. Mr. Wellman hopes to ascend from

an easily-reached base of operation in northern Spitzbergen, the point of departure being only 550 geographical miles from the Pole. He will leave Norway for Spitzbergen in June, and expects to start on his air journey in August.

VARIOUS.

GLACIAL EROSION.—Those who still question the efficiency of ice as an important agent of erosion will gain small comfort from reading Prof. Davis' last contribution to that subject (*Scottish Geographical Magazine*, Vol. XXI, 1906, pp. 76-89), originally read before the Cape Town meeting of the British Association. His paper is a general discussion of glacial erosion, and so clear and convincing that it is difficult to believe that it can be carefully read without carrying conviction with it. The paper does not admit of an abstract; it must be read as a whole. And surely the great majority of readers must agree with the concluding sentence, that "The sculpture of mountains by glaciers is indeed now proved by so many facts, widely and yet systematically distributed, that it savours of extreme conservatism any longer to deny the efficacy of glacial erosion."

R. S. T.

GEOGRAPHICAL CYCLE IN AN ARID CLIMATE.—The cycle of normal development of a river valley, for the full statement of which geographers are indebted to Prof. Davis, has been of immense value to the progress of scientific geography. In a recent number of the *Journal of Geology* (Vol. XIII, 1905, pp. 381-407), Prof. Davis has shown, by the deductive method, what the probable development of land-forms in an arid climate would be throughout a complete geographical cycle, and wherein it would depart from the cycle in a humid climate. In his paper he clearly shows how, in a region of interior drainage, the combination of stream erosion, deposit of waste, and wind action will cause the gradual reduction of the land-surface to a plain of high level, which he calls levelling without base-levelling. This result, first stated by Passarge in his description of the Kalahari Desert (*Die Kalahari*, Berlin, 1904), Prof. Davis calls Passarge's Law. Doubtless, owing mainly to the fact that arid regions have not been studied by geographers with the normal cycle of development of arid land-forms in mind, it is not now possible to cite illustrations of the many steps in this development; but the final stage of levelling, the arid land old age, seems to be clearly illustrated in the Kalahari region, where an extensive upland plain truncates a series of very diverse rocks, with only minor undulations where especially-resistant areas stand up above the general level as monadnocks. Prof. Davis adds that, in view of Passarge's Law, it is necessary to reconsider some of the cases of high-level peneplains, which may have been produced in an arid climate without the necessity of the theory of base-levelling and subsequent uplift; and he points out that this is necessary even in regions of present humidity, since, by climatic changes, humid regions of the present may formerly have been arid. This paper by Prof. Davis is an important contribution to physiographic literature.

R. S. T.

WATER-VAPOUR AND NOCTURNAL RADIATION.—J. R. Sutton, meteorologist of the De Beers Consolidated Mines, Kimberley, South Africa, some years ago made a study of the relation between the minimum temperature at Kimberley and the absolute and relative humidities. A comparison was made between the fall of temperature between 8 P.M. and the succeeding minimum on every clear night throughout one year on the one hand, and the absolute and relative humi-

dity at 8 P.M. on the other. The conclusion was that no certain connection could be traced between the dew-point at 8 P.M. and the fall of temperature, but there did not appear to be a uniform increase of range of temperature with a decreased relative humidity (J. R. Sutton: "Aqueous Vapor and Temperature," Symons's Met. Mag., Aug., 1895). During the past few years Mr. Sutton has been investigating this matter further, using as a standard the fall of temperature in one hour corresponding to the relative and absolute humidity at the beginning of the hour. It appears from his tables that the absolute and relative humidities are quite independent of each other in this inquiry; that there is no decided relationship between either element and the wind velocity, and that the relative humidity is the only element which shows a relation to the fall of temperature.—("The Influence of Water Vapour upon Nocturnal Radiation," *Sci. Proc. Roy. Dubl. Soc.*, XI, N. S., Aug., 1905.)

R. DEC. W.

SYNCHRONOUS VARIATIONS IN SOLAR AND TERRESTRIAL PHENOMENA.—Under the foregoing title, H. W. Clough has recently (*Astrophys. Journ.*, XXII, 1905, 42-75) published the results of a somewhat extended investigation made by him, chiefly along the lines laid down by Brückner in his well-known work, *Klimaschwankungen seit 1700*, in which the evidence in favour of a cycle of about thirty-five years in certain climatic elements, such as temperature, rainfall, pressure, and so on, is very fully presented. An examination of the 36-year cycle in solar phenomena leads to the conclusion "that periods of maximum solar activity, characterized by a minimum length of the 11-year cycle, are followed 7 to 10 years later by terrestrial temperature minima, and 6 years thereafter by rainfall maxima; and that, coincidently with the low temperature, the activity of the general circulation reaches a maximum, and storm centres move with increased velocity and in lower latitudes." Further study of the $3\frac{1}{2}$ -year cycle in solar activity shows that the conditions which prevail at or shortly after the secondary maxima of solar activity in this cycle are identical with the conditions which exist in connection with the solar maxima in the 36-year cycle. The results are therefore mutually confirmatory. Increase in solar activity, both in short and long periods, produces an increased activity of the circumpolar whirls, forcing masses of cold air equatorward, and causing both low and high pressure areas to move in lower latitudes and with increased velocity. Again, variations in solar activity in a 300-year cycle seem to be associated with variations in the length of the 36-year cycle, ranging from 30 to 45 years, and there are similar variations in the length of the 11-year cycle. Thus there appears to be a close connection between variations in solar and terrestrial phenomena in 300-year, 36-year and $3\frac{1}{2}$ -year cycles.

R. DEC. W.

THE MAGNETIC SURVEY OF THE PACIFIC OCEAN.—We learn from Dr. L. A. Bauer that the yacht *Galilee*, which is engaged in the magnetic survey of the Pacific Ocean under the auspices of the Carnegie Institution, Washington, left San Diego on March 2d to begin her second cruise. It will be recalled that her first cruise last fall was from San Diego around the Hawaiian Islands and back to San Francisco. On her present journey she is expected to make about 20,000 miles by the end of the year, visiting the waters of Fanning Island, Samoa, Fiji, the Marshall Islands and Guam, Yokohama, the Aleutian islands and back to San Diego. Several members of the former staff were obliged to return to their official duties, and the command of the vessel was accordingly entrusted to Mr. W. J. Peters, formerly of the astronomical and topographical corps of the

U. S. Geological Survey. Mr. Peters, while with the second Ziegler Polar Expedition, made a valuable series of magnetic, meteorological, and tidal observations at Teplitz Bay, Franz Josef Land. The other members of the staff are Messrs. J. C. Pearson, formerly Instructor of Physics in Bowdoin College, and J. P. Ault, magnetic observers, and Dr. H. E. Martyn, surgeon and recorder. Sufficient funds have been allotted to permit carrying on the work throughout the year.

According to a dispatch received early in April, the *Galilee* arrived safely at Fanning Island on March 31, having accomplished the trip of 3,500 miles from San Diego in 29 days, besides executing successfully magnetic work along the entire cruise.

NOTES.—THE PARIS GEOGRAPHICAL SOCIETY has awarded one of its gold medals to Major C. H. D. Ryder for his work as surveyor and explorer and his expedition to the sources of the Brahmaputra, in connection with the recent Tibet Mission.

THE CARNEGIE INSTITUTION is said to have purchased a tract of six acres in the northwest section of Washington, where it will erect a permanent home. The site is near the building of the United States Bureau of Standards, and overlooks the entire city. The price paid was \$35,000 an acre, and a building to cost \$100,000 will be erected at once.

A. HARTLEBEN'S *Statistische Tabelle* for all countries has appeared for 1906, with the latest official information as to the density of population, state finances, commerce, communication, weights and measures, army and navy, large cities, etc. All these facts are tabulated on one sheet, 39 by 28 inches in size. The "*Kleines Statistisches Taschenbuch*," by the same firm, gives all this information in a neat little volume of 104 pp. that may be slipped into a side pocket, and is sold for M. 1.40.

PROFESSOR C. W. HALL, of the University of Minnesota, is writing a geographical guide to the towns and cities of the State. It will be published during the year by the Geographical Society of Minnesota, which held its second annual meeting at the State University of Minneapolis on Dec. 26 last. In the past year the Society had four field days.

PROF. HEINRICH RIES, whose book on the "Economic Geology of the United States" has recently appeared, completed last year a report on the clay industries of Wisconsin, which was recently sent to press by the Geological and Natural History Survey of that State.

DR. A. J. HERBERTSON, Reader in Geography at Oxford, has been appointed by King Edward as the scientific member of the Royal Commission which has just been chosen to inquire into the condition of the canals and other inland navigation of the United Kingdom.

AMERICAN GEOGRAPHICAL SOCIETY—TRANSACTIONS, MARCH, 1906.—A Regular Meeting of the Society was held at Mendelssohn Hall, No. 119 West Fortieth Street, on Tuesday, March 20, 1906, at 8.30 o'clock, P.M.

Vice-President Moore in the chair. The following persons, recommended by the Council, were elected Fellows:

C. G. Rothschild.
Lewis A. Platt.
Carl C. Shippee.
Edmund H. Sears, 2nd.

Charles Henry Davis.
Anna Eaton Collins.
George Gilbert Entz.
Jesse R. Grant.

Edward G. Peters.
Edwin S. Townsend.
James J. Sheppard.
Murray M. Shoemaker.
Dwight A. Jones.
Paul J. Sachs.
Frederick G. Morgan.
Arthur W. Stevens.

Arthur Edward Spohn.
Edward A. Sumner.
Rush Sturges.
Henry N. Sweet.
Charles Hamot Strong.
Walter W. Shaw.
William M. Chadbourne.

The Chairman then introduced Prof. Albert Perry Brigham, who addressed the Society on the Fiords of Norway. Stereopticon views were shown. On motion, the Society adjourned.

EXHIBITION OF MOUNTAIN VIEWS.—The collection of Signor Sella's photographs of the Alps, the Caucasus, the Himalayas, the Saint Elias range, and Mount Etna, lent to the Society by the Appalachian Club of Boston, was opened to the Fellows and the public in the Society's house, 15 West Eighty-first Street, for the four weeks ending March 14.

NEW MAPS.

AFRICA.

BRITISH EAST AFRICA.—Map of East Africa Protectorate. Scale, 54 statute miles to an inch. Prepared by the Public Works Department, Mombasa, 1906.

This excellent map accompanies the "Hand-book for East Africa, Uganda, and Zanzibar for 1906." It shows in colours the seven provinces into which the southern part of the Protectorate has been divided. The northern portion has not yet been organized. The headquarters of provinces and districts and military and railroad stations are indicated.

EGYPT.—Geological Map of the Fayum Depression. Scale, 1:250,000, or 3.95 statute miles to an inch. Survey Department, Cairo, 1905.

This map is based upon the Geological Survey operations which were begun in 1898 in the desert surrounding the Fayum. The Fayum is a large circular depression in the Libyan Desert west of the Nile and to the south of Cairo. The depression contains about 12,000 square kilometers, and is divisible into cultivated land, lake, and desert, as shown in the map which accompanies a report on the "Topography and Geology of the Fayum Province."

AMERICA.

U. S. GEOLOGICAL SURVEY.

Reclamation Projects, Gaging Stations and River Surveys. Scale, 115 statute miles to an inch. Washington, 1905.

Accompanies the third annual Report of the Reclamation Service. Shows the principal reclamation projects, the areas within which public lands have been reserved for irrigation, projects under construction, approved, or under investigation, river gaging stations and river surveys. The Report also includes

sketch maps of the Salt River, Milk River, and other important irrigation projects.

Map showing Location of Corundum Deposits in the United States. Bulletin No. 269. Washington, 1906.

Corundum was believed, a generation ago, to be a comparatively rare mineral, but it is now known to be widely distributed. It is found in most of the Atlantic States from Maine to Georgia and also in Montana, California, and Colorado.

(A) Map showing the Position of the Main Ground-Water Table on Long Island, N. Y. Scale, 1:62,500, or 0.9 statute mile to an inch. Washington, 1904.

(B) Map showing Water Work Systems of Long Island, N. Y. Scale, about 2 statute miles to an inch. Reduced from U. S. Geol. Sur. Atlas Sheets. Washington, 1903.

(C) Map of Long Island, New York, showing Location of Wells. Scale, about 2 miles to an inch. Washington, D. C., 1904.

These are among the maps which illustrate Professional Paper No. 44 on the underground water resources of Long Island. A shows the surface and ground-water divides, driven well stations of the Brooklyn Department of Water Supply, etc. B shows water mains, pumping stations, stand pipes, reservoirs and supply ponds, and gives the boundaries of the various waterworks systems. C shows well locations, groups of wells, etc.

Coal Fields of the United States, showing Areas of Coal-bearing Formations. Scale, about 110 statute miles to an inch. U. S. Geological Survey, Washington, D. C., 1906.

Accompanies Report (Professional Paper No. 48) on the operations of the coal-testing plant at the St. Louis Exposition in 1904. Localities that were sampled are indicated and the lignite fields of the Gulf States are shown.

UNITED STATES.—Geological Map of Essex County, Mass. Scale, 1:62,500, or 0.9 statute mile to an inch. By John H. Sears, Essex Institute, Salem, Mass., 1905.

This excellent map accompanies the book Mr. Sears has written on the "Geology of Essex County, Mass." Based on the Government topographic sheet, the scale is large enough to show the formations and outcrops. The contour interval is twenty feet.

UNITED STATES.—Map showing the Distribution of the Coal Measures of Maryland. Scale, 7 statute miles to an inch. By W. B. Clark and G. C. Martin. Maryland Geological Survey, Vol. V, Baltimore, 1905.

Shows in colours the distribution of the various coal formations and illustrates a long report by Dr. Clark and others on the coals of the State. The deposits are confined to the western part of Maryland, where for more than a half century they have been the basis of the State's most important mineral industry. This is one of the maps illustrating the elaborate report dealing with the coal deposits which has been in preparation by the Maryland Geological Survey for several years.

BRAZIL.—Vorläufige Skizze der Reisewege der Expedition Koch am Oberen Rio Negro u. Yapurá in den Jahren 1903-05. Scale, 1:4,000,000, or 63.1 statute miles to an inch. By Dr. Theodore Koch. *Zeitschrift* of the Berlin Geographical Society, No. 2, 1906.

The map illustrates Dr. Koch's four journeys, which embraced some wholly unexplored territory among the headwaters of the Rio Negro and the Yapurá

River. It accompanies the report of the ethnological and geographical work which he accomplished. Its distinctive feature is the distribution of the Indian tribes and their numerous villages on these waters, which mark the limits of the Amazon basin in this region.

GERMANY.—Verlauf des Kaiser Wilhelm-Kanals. Scale, 1:500,000, or 7.8 statute miles to an inch. Jahrbuch der Königlich-Preussischen Geologischen Landesanstalt und Bergakademie. Band XXIII, Berlin, 1905.

Shows the distribution of the coarse detrital material and the marine and fresh-water alluvium through which the canal was dug.

SWITZERLAND.—Karte des Oeschinen-Tales. Scale, 1:50,000, or 0.7 statute mile to an inch. Jahresbericht of the Bern Geographical Society, Vol. XIX, 1903-1904. Bern, 1905.

Accompanies a long paper by Dr. M. Gross on this beautiful mountain lake in the Bernese Oberland, to the study of which the author has brought all his resources. A map on a scale of 1:500 gives the profile of the lake bottom as revealed by numerous soundings.

POLAR.

ANTARCTIC.—Chart of the South Polar Regions. Scale of latitude, 1:14,000,000, or 220 statute miles to an inch. By J. G. Bartholomew, Edinburgh, 1905.

This map accompanies Dr. Mill's book, "The Siege of the South Pole." It is on a much larger scale than any other recent chart, and is a very fine product, containing all recent additions to our information, including Charcot's surveys of the outer coasts of the islands off Danco Land. The sea is coloured, to show the extent of the pack ice, tracks of all the explorers are given, and the scale is so large that no inset maps are required to show the details of the discovered coasts. Six small insets show the approximate limits of the unexplored area for the last 125 years.

ANTARCTIC.—Maps accompanying the "Rapports Scientifiques" of the results of the *Belgica's* voyage in 1897-98-99, published at the expense of the Belgian Government. J. E. Buschmann, Antwerp, 1903.

The maps include the route of the *Belgica* from Antwerp throughout her southern journey. In the Antarctic regions, the soundings, direction of the route or drift, the position of the icebergs, and the nature of the ice-pack are denoted. One sheet in colours is given to the surveys in Gerlache Strait.

OCEANIA.

NEW ZEALAND.—North Island. Scale, 14 statute miles to an inch. In the Report of the Department of Lands and Survey, New Zealand, for 1903-1904. J. W. A. Marchant, Surveyor General, Wellington, 1904.

Shows the principal waterfalls for electric power and the catchment areas of the New Zealand rivers. Insets give the names of seventy-eight waterfalls and the approximate areas of the catchment basins. A similar map in the same Report gives this information for Middle Island.

NEW ZEALAND.—North Island. Scale, 14 statute miles to an inch. In Report of the Department of Lands and Survey, New Zealand, for 1904-1905. Wellington, 1905.

Shows the state of the public surveys of the colony. Another sheet on the same scale gives similar information for Middle Island.

The Report for 1904-05 contains large-scale maps of North and Middle Islands showing the lands taken up during the year and lands available for settlement.

ATLASES.

ATLAS OF THE WORLD'S COMMERCE.—Compiled from the latest Official Returns at the Edinburgh Geographical Institute. Edited by J. G. Bartholomew. (Part 1.) George Newnes, London, and Frederick Warne & Co., New York, 1906. (Price per part, 25 cents.)

This is something new in the way of atlases, and it will fill an almost unoccupied field. The Atlas is to appear in 22 parts, of which No. 1 has been issued, and the other parts will be published fortnightly. They are sold in London at 6d. a part, or 11 shillings for the Atlas. The work will contain 176 quarto pages of coloured plates with more than 1,000 maps and diagrams, and text, including an alphabetically-arranged list of the principal commodities of commerce describing them and their geographical distribution. Part 1 gives an excellent idea of what the Atlas is to be. A double-sheet map of the world shows (a) the wheat-growing countries, areas being coloured to indicate large or small production; and (b) the lines of export. Five inset maps show the chief wheat-producing regions on a larger scale, and coloured, in the case of Europe and the United States, to show the number of bushels per square mile, and in India the percentage of net cropped areas devoted to wheat culture. The back of this sheet is given to a comprehensive and yet concise description of wheat, with six diagrams showing the production and consumption of the cereal and various phases of the commerce in it. The double-sheet map of coffee in commerce, with text on the back, may be similarly described. The dictionary of commodities in this part extends from *Abaca* to *Blubber*, with diagrams in the text. The preparation of this atlas has been in progress for several years, and, judging from Part 1, it is to be in every sense the most complete atlas of commerce that has yet been produced. Its predecessors have been especially intended for school use, while this atlas may not only be highly recommended to advanced classes in commercial geography but also to merchants as a superior reference volume.

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ATLAS, WORLD.—BARTHOLOMEW, J. G. The XXth Century Citizen's Atlas of the World. 156 pages of Maps and Plans, with an Index, Gazetteer and Geographical Statistics. London, George Newnes. [1901.] Folio.

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AUSTRALIA, WESTERN.—1903. *Scale* 25 miles = 1 inch. *Size* [4 sheets joined] 44 x 65 inches. Perth, Dep't of Lands and Surveys. [*Gift from H. F. Johnston, Surveyor General.*]

AUSTRALIA, WESTERN. 1905. *Scale* 50 miles = 1 inch. *Size* 22 x 32 inches. Perth, Dep't of Lands and Surveys. [*Gift from H. F. Johnston, Surveyor General.*]

[AUSTRIA-HUNGARY].—Artaria's Eisenbahn und Postkarte von Oesterreich-Ungarn. 6^{te} Auflage. *Scale* 1:1,500,000. [5 Insets, various scales.] *Size* 40½ x 30½ inches. Wien, Artaria & Comp. 1906. [*Folded in 8vo case, with 30 pp. text.*]

BOSTON AND THE COUNTRY ADJACENT.—Published at the Boston Map Store, Damrell & Upham, 1888. *Scale* 1 inch = 1 mile. *Size* 41¼ x 43½ inches. Coloured. [*Gift from John B. Uhle, New York.*]

CANADA. ONTARIO AND KEEWATIN, Rainy River Sheet. [Being Sheet 27 of the Standard Topographical Map.] *Scale* 1:500,000. *Size* 19 x 27½ inches. [Ottawa.] Dept. of the Interior. 1905. [*Gift from James White, Geographer, Ottawa.*]

[CAUCASIA, TURKEY IN ASIA AND PERSIA.—In Russian Text. Drawn and Published by the Topographical Department of the Caucasian Military Division. 1903. *Scale* 1:680,000. Ten Sheets: 1 to 9 measure, each, 23½ x 22 inches; Sheet 10, 6¾ x 22 inches. *Gift from the Caucasian Military Division, Tiflis.*]

CHILE, COMISION DE LIMITES.—Five sheets, as follows: Coquimbo-Aconcagua; Aconcagua; Aconcagua-Santiago; O'Higgins-Colchagua; Llanquique. *Scale* 1:250,000. *Sizes*, various, from 17 x 18 to 26 x 17½. Santiago, Oficina de Limites, 1895-1899. [*Gift.*]

CHILE, COSTA DE. TALTAL.—Por el crucero "Esmeralda" . . . en 1903. *Scale* 1:10,000. *Size* 16 x 14½ inches. Valparaíso, Oficina Hidrográfica. 1905. (Provisional) 127. [*Gift.*]

[CHILE.] MAGALLANES. SENOS SKYRING I OTWAY, i Canales adyacentes. Exploraciones de la Marina de Chile hasta 1904. *Scale* 1:250,000. *Size* 34 x 24 inches. Valparaíso, Oficina Hidrográfica. 1905. No. III. [*Gift.*]

[CHILE.] PUERTO I ENTRADAS DE QUELLON. Exploraciones de la Marina Chilena hasta 1905. *Scale* 1:75,000. *Size* 18 x 16. Valparaíso, Oficina Hidrográfica. 1905. [*Gift.*]

EDINBURGH, Plan of.—From the Royal Hotel Guide. [1905?] *Scale* 500 feet = 1 inch. *Size* 18 x 14½ inches. [7 views on reverse, 1 on face.] [*Gift from John B. Uhle, New York.*]

EGYPT. CARTE DES CHEMINS DE FER DE L'ÉTAT, et des Compagnies Agricoles. *Scale* 1:400,000. *Size* [2 sheets joined] 30½ x 58 inches. [Insets of Cairo and Environs, Alexandria and Environs.] [Cairo], Bureau des Études. 1905. [*Gift.*]

[EUROPE, CENTRAL.] MITTELEUROPA, 1:750,000. Four specimen sheets, as follows: G-7, Banjaluka; G-8, Cattaro; H-7, Orsova; H-8, Skoplje. *Size* (each sheet), $17\frac{1}{2} \times 18\frac{1}{2}$ inches. Wien, K. u. K. Militärgeographisches Institut. 1901-1905. [Gift.]

[EUROPE, CENTRAL.] MITTELEUROPA, 1:750,000. [Four specimen sheets, same as above, orographically treated.] [Gift.]

[EUROPE.] Physik. polit. Schulwandkarte von Europa. In Verbindung mit Prof. Dr. G. Leipoldt in Dresden gezeichnet von M. Kuhnert, Lehrer in Chemnitz. *Scale* 1:3,000,000. 6 sheets, each 23×31 inches. Dresden, A. Müller-Fröbelhaus. [1905?] [Gift.]

LONDON, COUNTY OF.—Stanford's New Map, on the Scale of 4 inches to 1 mile. In 20 Sheets, each $16\frac{3}{8} \times 14\frac{3}{8}$ inches. Coloured. London, Edward Stanford. 1905.

[LONG ISLAND, North Shore of, from Manhasset Bay to Huntington Bay.] Showing the Breeding Places of Mosquitoes. Accompanying Report of the North Shore Improvement Association, 1901. Henry Clay Weeks, Engineer in Charge. *Scale* 3 inches = 1 mile. *Size* $53\frac{3}{4} \times 36\frac{5}{8}$ inches. New York, Copyrighted, 1902. [Gift from John B. Uhle, New York.]

MEXICO. Carta de la República Mexicana. *Scale* 1:100,000. [126 Sheets of the Survey Map, each $22 \times 16\frac{1}{2}$ inches.] Mexico, Secretaria de Fomento. 1896-1905.

NEW YORK, GEOLOGIC MAP OF, exhibiting the structure of the State so far as known. By Frederick J. H. Merrill, State Geologist. 1901. *Scale* 5 miles = 1 inch. 12 Sheets, each 21×25 inches. Albany, N. Y. University of the State of N. Y. [2 copies, one coloured, one uncoloured.] [Gift from F. J. H. Merrill, State Geologist.]

SELANGOR.—Federated Malay States, 1904. *Scale* 4 miles = 1 inch. *Size* $23 \times 27\frac{1}{2}$ inches. Compiled at the Revenue Survey Office, Selangor, from actual Surveys and various Explorations. Published by J. Bartholomew, The Edinburgh Geographical Institute. [Gift from the Superintendent of Revenue Surveys, Selangor.]

[SWEDEN.] FERNEBO [DISTRICT.]—Karta öfver Fernebo Härad. [Surveyed] 1863-74, [revised] 1894-95. *Scale* 1:50,000. 6 Sheets, each 20×28 inches. Stockholm, Rikets Ekonomiska Karteverk, 1896. [Accompanied by 38 pp. Descriptive Text.] [Gift from Dr. Aksel Andersson, Royal University of Upsala.]

[SWEDEN, SOUTHERN. Military Divisional Map.]—Karta öfver Rikets Indelnings i Inskriftnings, Bataljons-och Kompaniområden, 1886-1895. *Scale* 1:1,000,000. *Size* 29×43 inches. Stockholm, Gen. Stab Lit. Anst. [Gift from Dr. Aksel Andersson, Royal University of Upsala.]

[SWITZERLAND.] BODENSEE UND RHEIN, Karte von. Mit den angrenzenden Gebieten von Baden, Württemberg, Bayern, Österreich und der Schweiz. Bearbeitet von Prof. F. Becker. *Scale* 1:125,000. *Size* $28\frac{1}{2} \times 14\frac{1}{4}$ inches. Bern, H. Kümmerly und Frey und A. Francke. [1905.] [Gift from Prof. F. Becker, Zurich.]

[SWITZERLAND.] GRAUBÜNDEN, H. Kümmerly's Touristenkarte von. *Scale* 1:300,000. *Size* 23×16 inches. Bern, H. Kümmerly & Frey und A. Francke. [1905.] [Gift.]

TRINIDAD, ROADS IN.—Sketch, prepared by R. Kernahan and H. Massy, 1898; Revised by Public Works Dep't (of Trinidad), 1904. *Scale* $3\frac{1}{2}$ miles = 1 inch. *Size* 37 x 25 inches. Printed at the Ordnance Survey Office, Southampton. 1905. [*Gift from the Public Works Dep't of Trinidad.*]

TUNISIE, CARTE ROUTIÈRE DE LA. Au 1^{er} Juillet, 1905, dressée par la Direction Générale des Travaux Publics. *Scale* 1:500,000. *Size* $27\frac{3}{4}$ x $39\frac{1}{2}$ inches. Inset, Environs de Tunis, *Scale* 1:200,000. Paris, Erhard Frères. [*Gift from the Directeur Général des Travaux Publics, Tunis.*]

WASHINGTON, STATE OF.—Compiled from the Official Records of the General Land Office and other sources, under the direction of Frank Bond, 1905. *Scale* 1 inch = 12 miles. *Size* $34\frac{1}{2}$ x $22\frac{3}{4}$ inches. [Washington, D. C.], Dep't of the Interior.

VARIOUS.

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HAHN, F.—Die Eisenbahnen, ihre Entstehung und gegenwärtige Verbreitung. Mit einer Doppeltafel und Abbild. Leipzig, B. G. Teubner. 1905. 16mo.

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HUMBOLDT, ALEXANDER VON.—Kosmos. Entwurf einer physischen Weltbeschreibung. Stuttgart u. Tübingen, J. G. Cotta. 1845-1862. 5 vols., 8vo.

LIZNAR, J.—Die Barometrische Höhenmessung. Mit neuen Tafeln. Leipzig u. Wien, Franz Deuticke. 1904. pr., 8vo.

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PLATANIA, GAETANO, ET PLATANIA, GIOVANNI.—Effets magnétiques de la foudre sur les roches volcaniques. [Extract.] (*Comptes Rendus des Séances de l'Académie des Sciences*, 1905. Paris, Gauthier-Villars.) pr., 4to;

SUL MAGNETISMO prodotto da Fulminazioni. Estratto dalle Memorie della Classe di Scienze della R. Accademia degli Zelanti, 3a Serie, vol. IV, 1905-1906. Acireale. 1906. pr., 8vo.

SCANDLIN, CHRISTIANA.—Hans, the Eskimo. A Story of Arctic Adventure. Illustrated. New York, Silver, Burdett & Co. (1903.) 16mo.

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WHO'S WHO IN AMERICA, 1906-1907. (Vol. IV.) Edited by John W. Leonard. Chicago, A. N. Marquis & Co. 8vo.

WILDERMANN, MAX.—Jahrbuch der Naturwissenschaften, 1904-1905. Freiburg-im-Breisgau, Herdersche Verlagshandlung, 1905. 8vo. [Gift.]

ZEITSCHRIFT DES DEUTSCHEN UND ÖSTERREICHISCHEN ALPENVEREINS.—Band 36, 1905. [Maps and Plates.] Innsbruck, Verlag des D. und O. Alpenvereins.

BOOK NOTICES.

Guida dell' Abruzzo, di Enrico Abbate. Prima Edizione. pp. viii+558
(maps in pocket). Ermanno Loescher & Co., Roma, 1903.

A very handsome map of the Abruzzo, coloured, and six sectional ones, after the manner of the yet unsurpassed Dufour Atlas of Switzerland, accompany this volume, the title of which as "Guide" is entirely too modest. It is far more than a guide. It is a thorough, systematic description, from a standpoint of observation, study, and research, of that portion of Italy hitherto least known, because least accessible, and the Alpine Club (Roman section), as well as the author, may justly be congratulated on the production of such a meritorious work.

It is superfluous to dwell on the value of the geographical portions of such a description; the mere fact that it is published under the auspices of the Italian Alpine Club guarantees its excellence. The chapter on Geology and Mineralogy is especially interesting, through the full detail it gives of the structure of the Apennines. Quoting Verri, the author says: "Imagine a sheet of metal marked with undulations from the northwest to the southeast, incline the sheet to the west and bend it like a bow in the direction of its length; like this, to me, is the backbone of the Central Apennine, with its elevations and depressions." The principal formations are the Triassic, the Jurassic and, particularly, the Cretaceous and Tertiary. A list of characteristic fossils is given in each instance. The author mentions an emersion of the land—general at the time over Europe—at the close of the Tertiary period, and another of the Abruzzo at the end of the Pliocene. Of glacial action there are many very interesting evidences, showing vestiges at an altitude that exceeds 2,000 meters, and even reaches 2,400. While in central Italy volcanic phenomena appear mostly during the glacial epoch, in the Abruzzi the traces are confined to strata resting immediately on the Pliocene. To-day volcanic action is limited to mud-volcanoes and to a few sulphurous springs of little practical importance.

The author regards man as having been "a witness of all the phases that accompanied the glacial epoch," and recounts a number of finds in caverns of implements of the most primitive types; without, however, alluding in a direct manner to animal remains accompanying them, except in so far as they have furnished the material for artifacts. Hence his assumption of the existence of man at the very remote period when the country was under the pressure of glacial action is as yet insufficiently supported. He says: "No object has been found which bore traces of design like those discovered in other places; they were perhaps made in bone or wood, materials easily destroyed, and in this way failed to reach us." An abundance of weapons has been found locally gathered, as if they had been manufactured there for the purpose of commerce with other centres.

Valuable and written with much caution is the section on history. The many obscure points concerning the possible origins of those inhabitants of whom early documentary information exists are treated with due circumspection, and what is not established is left in doubt. Latin authors, of course, furnish the first and earliest data, and the contests between the Sabines and the Romans have left much material illustrating the period between the fourth and seventh centuries of the Roman era. The Middle Ages are a fertile field, and the historical notes are carried to the period after the fall of the Bourbons in 1860.

According to reliable data, the population of the Abruzzo has, since 1500, increased from a quarter of a million to 1,136,159 at the present day, which increase appears to have been quite uniform. Descriptions of the physical appearance and character of the people are concise and guarded at the same time. The remarks on the language tell us that no trace is discernible in it of the ancient Oscan. Signor Abbate considers the dialect now spoken as a mixture of the Neapolitan with that of the Roman Campagna and survivals of the language that may have sprung up after the Roman conquest.

Lengthy but by no means tedious descriptions of the three groups into which the land is geographically and politically subdivided follow a very interesting discussion of Abruzzan art from the earliest time to this day, and the indispensable review of economic conditions. The book closes with chapters specially designed for tourists. Less than a quarter of a century ago such a guide to the Abruzzo could not have been thought of, owing to the social and political state of that country. The mere fact of its issue is a sign of the great strides Italy has made and is making in the road of progress.

A. F. B.

Mémoire sur les Migrations des Tsiganes à Travers l'Asie. Par M. J. de Goeje. viii + 91 pp. E. J. Brill, Leyden, 1903. (Price, 2 fr.)

The learned author gives the results, in this little book, of his studies concerning the origin of the Gypsies and their wanderings from their ancient home in northwest India. He shows that the Gypsy immigrants, both into Europe and Egypt, had a common origin in the basin of the Indus, but that their original speech naturally acquired differing foreign elements as they travelled slowly westward. The language, for example, of those European gypsies who, in 1417, emigrated from Hungary into Germany, had a large admixture of Greek and Armenian words which were, of course, lacking in the speech of their fellows who went to Egypt and on the way adopted many Persian and Arabic words into their vocabulary. He shows from Arabic sources that the Gypsy emigrants left India much earlier than had formerly been supposed.

Siberia. A Record of Travel, Climbing, and Explorations. By Samuel Turner. xxiv + 320 pp. Numerous Illustrations, two Maps, 3 Appendices, and Index. A. Wessels Company, New York, 1905.

The author is a London business man who went to Siberia to study the enormous growth of butter production and the prospects of the industry in relation to the London daily markets. He is also a mountaineer; and as his business was concluded when he was within 400 miles of the highest Altai mountains, he devoted the remainder of his stay to the exploration of that largely unknown region which includes the Katunskië-Belki, the highest range of Central Siberia. It was his privilege to climb Belukha, the highest mountain yet discovered in Siberia. The larger part of the book is devoted to his winter expedition to the Altai, and to his journeys, shooting expeditions, and climbing among the mountains, together with his impressions of the inhabitants. Thus, on a business mission, the author was able to render some geographical service in a neglected region. The chapters in which he describes the wonderful development of cattle-raising and butter production are of absorbing interest, and the subject is more fully treated than heretofore in English. He says the butter output is now 80,000,000 pounds a year, and is capable of being increased fifteenfold. Most of the excellent illustrations are from the photographs by the author. The Altai Flora is described in pp. 375-415.

Zur Verständigung über die Begriffe Nation und Nationalität. Von Alfred Kirchhoff. 64 pp. Verlag der Buchhandlung des Waisenhauses, Halle a. S., 1905. (Price, M. 1.)

A discussion of the real meaning of the words Nation and Nationality, illustrated by many facts of history and by quotations from the writings of statesmen and sociological investigators.

Die Abstammung des Menschen. Von Wilhelm Bölsche. 99 pp. and numerous Illustrations. 24th Edition. Kosmos, Gesellschaft der Naturfreunde, Stuttgart. (Price, M. 1.)

The Kosmos Society at Stuttgart is stimulating the love of nature and acquaintance with its phenomena by publishing at a very cheap price small books like this one on various phases of natural history. The books are designed for the widest circle of readers, and any one of them may be perused in a few hours. The present volume, on the descent of man, is based on evolution as expounded by Darwin and Haeckel. A number of the illustrations are introduced to show the points of resemblance between the human embryo and that of some of the lower animals. The rather striking picture in colours on the title-page shows one of our progenitors in the Ice Age proudly erect on the body of a giant mammoth he has just killed and brandishing his spear over the victim of his prowess.

Mathematische Geographie (Miniatur-Bibliothek, 671-673). Von Franz Baur. 140 pp. and 21 Figures. Albert Otto Paul, Leipzig. (Price, 30 pf.)

A 16mo volume dealing with the size, shape, weight, and movements of the earth and heavenly bodies, the determination of geographical positions, etc. A clearly-written, though brief, manual, which requires on the part of the reader considerable knowledge of plane and spherical trigonometry.

An Introduction to Practical Geography. By A. T. Simmons and Hugh Richardson. pp. 380. Macmillan & Company, London, 1905.

Simmons and Richardson's Introduction to Practical Geography is a small volume, containing twenty-five chapters of suggestions as to practical work in geography available for field and laboratory. The difference between physical geography in America and England is shown by the fact that fourteen of the twenty-five chapters are devoted to mathematical geography and maps, seven to the atmosphere, and one each to rivers, the sea, plant geography, and man's dwelling-place.

Many of the exercises are too detailed for use in American schools, but all are suggestive, and many are extremely ingenious. The graphic representations of the simpler map projections are very helpful, and the problems in longitude, time, and climate are very pertinent. The book deserves to be consulted by every teacher of physical geography who would depart from the somewhat formal laboratory work of American schools.

R. E. D.

The Egyptian Sudan. By J. Kelly Giffen. 252 pp. Maps and Illustrations. Fleming H. Revell Company, New York. (Price, \$1.00.)

Very little has been written about the Anglo-Egyptian Sudan since Kitchener put an end to the Mahdist tyranny and the Sudan was once more opened to civilization. Great work has been done there, and this book is a desirable contribution to the story of the development of this part of Africa.

The two lines on which the Anglo-Egyptian Sudan is developing relate to its agricultural and commercial prospects and possibilities, and to the educational and humanitarian interest. Dr. Giffen's book deals with the country in both these interesting aspects; and as he has lived there for years and has devoted his life, as a missionary, to the welfare and enlightenment of the people, he was especially qualified to make the book instructive. He describes the Sudan as far south as the great Sobat, tributary of the Nile, where he founded a missionary station. He says that although the climate of any part of the Sudan is trying, it is possible for the white man to live there and do good work. Frequent changes may be necessary, however, to preserve health.

A Yankee in Pigmy Land. By William Edgar Geil. x and 364 pp., and many Illustrations. Dodd, Mead & Company, 1905. (Price, \$1.50).

Mr. Geil would have immortalized his name if his crossing of Africa had occurred thirty years ago; but these trans-continental journeys are not an uncommon occurrence to-day, and most of them, like Mr. Geil's trip, are facilitated by the steamboat and railroad.

The book is the story of what its author saw during his journey from Mombasa, on the Indian Ocean, to the mouth of the Congo by way of the great tropical forest inhabited by pygmies to the west of the Albert Nyanza. It is full of interest and information. Nearly one-fourth of the space is given to the pygmies, and probably no other book contains so many photographs of these little people. The many suggestions as to equipment and hygiene offered to travellers in tropical Africa will be helpful. That region is to-day in a transition state, and an occasional book like this is especially desirable as giving a bird's-eye view of the latest phases of progress.

Hans the Eskimo. A Story of Arctic Adventure. By Christiana Scandlin. 125 pp. and 25 Illustrations. Silver, Burdett & Co., New York. (Price, 42c.)

The purpose of the book is to present a simple narrative of Eskimo home life, and especially to give school children an account of the lives of the little children of the far north. The book idealizes the character of Hans Henrik, and the facts used are confined to the stories he told on Kane's vessel, the *Advance*, as they appear in Kane's "Arctic Explorations."

We think the author's purpose might have been even more fully served if she had based her book upon the complete memoir of Hans which he wrote in the Eskimo language. This memoir was translated by Dr. Henry Rink and printed in *The Geographical Magazine*, Vol. 5, 1878. Dr. Rink translated the story because he had never read any adventures in the far north that were so curious and which so fully reflected the ideas and mental development of the Eskimos. The memoir covers not only the period of Kane's work but also the later expeditions of Hayes, Hall, and Sir George Nares, with all of whom Hans served.

The Junior Geography. By A. J. Herbertson, Reader in Geography in the University of Oxford. 288 pp., 166 black-and-white maps, and Index. Clarendon Press, Oxford, 1905.

The volume covers the regional geography necessary for the Oxford junior examinations. It is Vol. 2 of the Oxford Geographies, and the preliminary volume, in course of preparation, will deal especially with physical geography.

The type is large and clear, the maps remarkably numerous for so small a book, and every part of the world is described in some of its geographical aspects. Naturally, the quantity of letterpress cannot be great, and quality must be substituted if the book is to have any usefulness.

The book may fairly claim to be of high quality. It deals chiefly with physical features and the distribution of population, commodities, climates, etc., over the world's surface. It is limited to the most conspicuous and suggestive facts. The small black-and-white maps have abundant information, but the execution of many of them hardly equals even the American standard. The book is full of suggestiveness to the teacher, and in the hands of a competent instructor may easily be expanded into a course of practical geography.

Tibet and Turkestan: A Journey Through old Lands and a Study of New Conditions. By Oscar Terry Crosby. xvi and 351 pp.

Numerous Illustrations, 19 Appendices, Map in Colours, and Index. G. P. Putnam's Sons, New York, 1905.

Mr. Crosby's visit to Tibet was confined to the remote northwest corner of that country. He explored and he describes vividly the desolate nature of this part of the lofty plateau called Aksai Chan. Travelling for eight weeks at altitudes of 15,500 to 18,500 feet, the cold was intense, and the little party barely escaped with their lives. Mr. Crosby says that the hardships of the journey were in every respect more severe than those he experienced in Africa while travelling from Somaliland to Khartum.

In his account of Tibet the author tries, as too few explorers do, to see the inhabitants from their own point of view, and to discover how far their environment is responsible for their social and other peculiarities. The illustrations are admirable; but the three views in Lhasa might more properly have been credited to the Imperial Russian Geographical Society of St. Petersburg, which made these reproductions of the photographs taken by the Buriat Dorjief, than to the National Geographic Society of Washington.

Hinter den Kulissen des Mandschurischen Kriegstheaters, Von

Max Th. S. Behrman. 368 pp. and Map. C. A. Schwetschke & Son, Berlin, 1905. (Price, 4 M.)

Letters written by a war correspondent from Harbin and other points in the rear of the actual scene of the hostilities in Manchuria. The book, covering the period from March, 1904, to the end of the war, gives many views behind the scenes and statements of fact and opinion which were not permitted to reach the world during the progress of the war.

Two Years in the Antarctic. Being a Narrative of the British National Antarctic Expedition. By Albert B. Armitage. xix

and 315 pp. Numerous Illustrations, Map, 4 Appendices, and Index. Edward Arnold, London, 1905. (Price, \$4.)

This book deals only with incidents of the work and experiences of the last British expedition to Victoria Land. The author does not discuss Antarctic problems nor advance scientific theories, but tells the plain story of the life of about fifty men during their long sojourn in the South Polar regions. The book is well illustrated, and the letterpress is interesting, as it could hardly fail to be with such a wealth of incident at hand. For those who care to learn from a book on

the Antarctic only of the life and occupations of polar adventurers this volume will be satisfying; but if the reader wishes to get an idea of the scientific results of the Discovery Expedition and is interested in the theories and speculations to which such an expedition gives rise, he will have to read Captain Scott's large volumes.

The Elements of Geology. By William Harmon Norton. x and 461 pp., 374 Illustrations, Diagrams, Maps and Index. Ginn & Company, Boston, 1905. (Price, \$1.40.)

The author takes in turn the external and internal geological agencies and treats in connection with each of these processes the land-forms and rock structure which it has produced. Thirteen chapters are given to these principles and illustrations of physical geology and the final nine chapters to the historical view of the science. Especial attention is given in the historical section to North America, and the only map in colours is a geological map of the United States and a part of Canada. The book is simply planned, richly supplied with half-tone illustrations and small maps, is not overloaded with details, and is in every way an attractive book to put in the hands of the young student.

Erdkunde für Höhere Lehranstalten. Von Dr. Adolf Pahde. Part

- I: Unterstufe. vi and 108 pp., 36 Illustrations, and Index. (Price, M. 1.80.) II: Mittelstufe, Erstes Stück. iv and 134 pp., 8 Illustrations and Index. (Price, M. 1.80.) III: Mittelstufe, Zweites Stück. v and 169 pp., 14 Illustrations, and Index. (Price, M. 2.40.) IV: Mittelstufe, Drittes Stück. iv and 148 pp., 4 Illustrations, and Index. (Price, M. 2.) V: Oberstufe. v and 142 pp., 39 Illustrations and Index. (Price, M. 2.50.) Carl Flemming, Glogau, 1905.

These small text-books are intended for the several grades in the high schools and lead up to courses in the gymnasia. Vol. I deals with the fundamental principles of geography, the shape and movements of the earth, and presents the essential facts relating to the continents and a concise treatment of Germany; Vol. II and III are devoted to the other continents; Vol. IV contains a fuller discussion of Germany, and Vol. V is given to mathematical, physical, and biological geography, map projections, and commercial highways. The books are meant to meet the fact that the time given to geography in the "Höhere Lehranstalten" is short. The choice of matter is excellent, and the style is marked by simplicity of statement and brevity of sentences. The series will be most useful in the hands of thoroughly-equipped teachers, for such instructors will find it full of suggestion for the amplification of each topic.

Jahrbuch der Naturwissenschaften, 1904-1905. Edited by Dr. Max Wildermann. xiii and 537 pp., 28 Illustrations, and an Index covering the volumes for 1900/1-1904/05. B. Herder, St. Louis, Mo., 1905. (Price, \$2.)

The twentieth issue of this volume maintains its high reputation as one of the best periodical records of scientific progress. A section is given to each of the thirteen leading branches of science, and all the more important phases of discovery and progress in each field, for the year under review, are described by specialists. Among the sections of special interest to geographers are geography, mineralogy and geology, anthropology, ethnology and archæology,

meteorology, zoology, and forestry and agriculture. The index and obituary list cover the last five volumes. The work is admirably edited, the index makes all information available, and the book is not only an accurate reference volume but also a work that will interest many general readers.

Panama to Patagonia. The Isthmian Canal and the West Coast Countries. By Charles M. Pepper. With Maps and Illustrations. pp. xxii-400, 8vo. Chicago, A. C. McClurg & Co., 1906.

Mr. Pepper has written a book that is pleasantly unpretentious and handsomely illustrated. The maps are as good as they can be, fully answering their purpose. Statistics, tables of distances, indications in regard to climate and vegetation, abound, and they are mainly correct. The journey of Mr. Pepper encompassed the whole South American coast from Panamá to Punta Arenas, some of the Peruvian interior, and great part of western Bolivia. Most of his observations on the present condition of the countries he visited are just, showing that he saw with unprejudiced and intelligent eyes and listened attentively to good sources of information. There are, of course, a number of misstatements in regard to the early past, and some queer appreciations of art and architecture; but as the author makes no pretence to treat of such matters authoritatively, it would be unjust to chide him. His purpose is "to consider and describe the effect of the Panama Canal on the West Coast countries of South America from the year 1905," and he has honestly endeavoured to attain it. He justly says:

The effort to divorce economic and social forces from places and peoples in order to analyze a principle usually is so barren that I have not attempted it. Places have their significance, and people are the human material. Customs and institutions are only understood properly in their environment.

A. F. B.

Das Problem der Völkerverwandtschaft. Von Dr. Joh. Richard Mucke, ord. Professor an der K. Universität Jureff (Dorpat). Greifswald, Verlag von Julius Abel, 1905. (Pr., M. 7.50.)

The main purpose of this book is to disprove the common theory of an "Urvolk," which the author denounces as unscientific, because it constructs, first, an imaginary nation in order to explain the existing ones, and, then, an imaginary country from which said nation is supposed to have spread. To put the discussion upon a more scientific basis he pursues his investigations by a strictly "geographico-statistical" method, collecting facts from all available records of history and ethnology, examining the "geographical individual" from which each observation is recorded, and from the material thus classified in a card catalogue of some 35,000 cards he has gained the conclusion that the idea of a common origin of the nations by migration from some original centre, whether we call it Aryan or otherwise, must be entirely abandoned. His opinion is that every nation has grown up more or less strictly on the same geographical individual which it occupies in the present, and that its origin is due to an amalgamation of highland and lowland peoples. Whether in South America, in ancient Greece, or in Tacitus's Germania, everywhere the same two components of the population present themselves: one, with common characteristics, occupying the low parts of the country, along rivers and by lakes or swamps; the other, with as distinct characteristics of its own, on the hills, interspersed among the former.

Under primitive conditions, when the two components still existed separately, the ethnological unit was the "*horde*," often inadequately called clan, tribe, family,

etc.—namely, a group of people camping or housing together and connected by blood kinship. The character of their common habitation he defines exclusively as a resting-place, emphatically denying that the desire for protection should have anything to do with its origin. As some may disagree with him on this point, it is to be regretted that, of all the assertions made in the book, this should be the only one which is not supported by positive facts. The shape of the camp, and of the later house, was given by the habits of the *horde* of lying down to rest, and this was, in its turn, predestined by the geographical individual on which they camped—namely, in straight parallel rows along the rivers, in “round rows” (?)—“*Rundreihen*”—on the hills. Thus the long-house and the round-house are found as the two primitive forms of house-building all over the world. The space thus covered by the *horde* is the “dwelling space” (*Wohnraum*), in distinction from the “living space” (*Lebensraum*), which includes the area which furnishes the horde their means of living. The concept *horde* in the fullest of its meaning includes, then, (a) the dwelling space, (b) its occupants, (c) the special order maintained on that space, (d) the boundary of that space.

As long as the *horde* lives a separate life for itself, sexual relations are naturally endogamous, so that the language even makes no distinction between brother and husband, father and uncle (“avunculate”). Thus neither matriarchy nor patriarchy can claim to have stood at the beginnings of society, both having evolved, not from promiscuous intercourse, which is a sign of decadence wherever found, but from the primitive intercourse between “brothers and sisters”—viz., blood relations constituting the *horde*. The author's explanation of how intercourse between blood relations came to be avoided is perhaps the best that has ever been given, because it works entirely without instincts or the awakening of a “moral consciousness” to the horror of incest. It is based on the distinction between *matrimonium* and *familia*. The plain facts which he gives are these: Within the *horde*, where all are of the same kin, there are no masters and no servants. If one of them stands out as a *primus inter pares* the relation of the other members of the *horde* toward him, as toward each other, is only one of *obsequentia*, not of *obedientia*. No husband-brother can thus be the master of his wife-sister, nor can she be his mistress. For service, they capture outsiders: the women are given strangers to do men's, and the men to do women's, work for them. These outsiders, who must not enter the common house, live in huts near, or annexed to, it. Sexual intercourse will occur between master, or mistress, and servant; their children, then, are considered the master's and his sister-wife's, or the mistress's and her brother-husband's children—viz., members of the *horde*, their natural father or mother not counting at all; in case of war, they will even fight against their own ancestors and relatives outside of the *horde*; they are not considered their relatives. This is the germ of matriarchy and patriarchy. In the course of time the community of interests between the servant-husband or wife and the mistress or master will cause the member of the *horde* to follow him or her into the outside hut, leaving the common house, and thus we obtain the *family*—viz., a relation founded on service, where *obedientia*, not *obsequentia*, is the foundation, and in which marriage has lost its character of a partnership among equals, which it had been in the *horde*, where either husband or wife reigns supreme. The more it became an established custom, the less possible would it become for a brother or sister to “marry” each other in the new conception of the word, until gradually tradition established a divine commandment to avoid such marriages.

The common house is now deserted; its inhabitants, if any, are only unmarrried members of the former *horde*, or it becomes a mere club or meeting-house for the tribe. For now the *horde* has ceased to exist; it has become a *tribe*—viz., a congregation of families, composed of native and foreign elements, in which *obedientia* reigns; the chief is an actual monarch, whether he has the title of one or not, and it has an aristocracy, in which the descendency from *horde* origin is expressed. This aristocracy often has a "secret" language; it is the old *horde* idiom, preserved among those of the purest blood; other tribes are reported to have a special "women's language": the idiom of the foreign wives, preserved among their descendants, while the general language of the tribe is the product of assimilation between *horde* and foreign elements.

The long-house of the lowland *horde*, constructed on a moist soil exposed to inundation, was the original pile dwelling. In trying to raise the floor of their dwelling the *horde* utilized trees, and, where no trees were found, artificial piles were driven into the ground to build the houses on. From these pile dwellings it was only one step to the real lake dwelling, and lowland *hordes* and lake dwellers are practically synonymous. This correlation is very strongly supported by the legends of the nations whose origin can be traced to the lowland *hordes*, which, when stripped of mythical additions of later times, show in a most striking manner the relations of their forefathers to the moist element. Their occupation, in the rich bottom-lands, was agricultural, while the highland *hordes*, in the seclusion of their individual aggregations, became the originators of arts and crafts, and thus of the industries. The desire to have at their command persons with such different talents caused the captures of members of the different *hordes* from which the family and tribal relations evolved. This constant assimilation of most heterogeneous elements created relationships of nations and of languages which have as yet never been studied from this point of view by the philologists, and while space does not allow to enter here into any detail about the ways in which, both in following up national myths and tracing primitive word-stems, the author carries on his deductions, it is certain that no ethnologist or linguist interested in the problem can afford to let them go unnoticed; for they promise to put the discussion upon an entirely new basis.

So much more is it to be regretted that the author does not shrink from depreciating the work of other scholars in order to show the merits of his own, and it takes a fair-minded reader not to lay the book aside with disgust at his abuse of names like Ratzel and Schurtz because he fails to see in what line the merits of the "people with ideas" are to be found. Even if we admit that their work is incongenial to such an exact thinker as the author, and that parts of it will be superseded in the course of time by the results of later investigations, calling them "superficial," "bereft of judgment," "possessed of fixed ideas," does not disprove them. Anybody able to wield the weapon of such overwhelming argument—as, for instance, Dr. Mucke does—against Schurtz on the subject of the use of the common house as the men's house (*versus* Sch.'s "Männerbünde") only debases himself by poisoning his weapon as he does, and so much more if they for whom the venom is intended are no longer on the field of battle. The book was published in 1905, Ratzel died in 1904, and Schurtz even in 1903. If these passages were written before that time, common decency ought to have prompted the author to take them out before publication. Moreover, it is evident for any one "who has not yet, by self-made associations and empty fancies, been reduced to that abnormal condition of the brain which we call fixed idea" that in a majority

of cases he evidently misunderstands or misinterprets Ratzel's words. If this may be excused in one who probably never worked with the originator of anthropogeography, there is nothing that will acquit him of the charge of unfairness in attacking a man in 1905 for what he said in the first edition of his book more than twenty years ago, when in the second edition, of 1899, a great percentage of the very passages on which the criticism is based had been *omitted*. As to obscurity of expression and triteness of style, sentences like these: "*Horde* is the relation of reciprocity between space and the group of people who live on it," or "Wherever man lives, he lives on a certain space. But this space becomes a living space only by his living on it. There would be no living space if nobody lived on it, and there would be no living without a space on which to live," do not prove that the author's style is free from the defects which he blames in others. He will oblige his readers if in a second edition he spares them the unpleasant task of working their way through pages and pages of disparaging remarks in order to get what valuable material is imbedded in them, especially in the first two chapters, and he will serve his own interest best of all by thus enabling us to give him full credit for his work without having first to overcome the disgust caused by his way of presenting it.

M. K. G.

Natur und Arbeit. Eine allgemeine Wirtschaftskunde von Prof.

Dr. Alwin Oppel. Two vols. With numerous illustrations, plates, and maps
Leipzig and Vienna, Bibliographisches Institut, 1904. (Pr., M. 20.)

Another of the beautiful "popular" handbooks published by the Bibliographical Institute. It may be called a compendium of economics in the broadest conception of the word, and will prove a most valuable source both of instruction and reference for anybody able to read German. It contains, first, a discussion of the natural foundations of economic development, giving brief treatises on general geology, minerals, soils, the principles of oceanography and climatology, the vegetable and animal kingdoms, and the general principles of the economic progress of man; secondly, a history of economics, in which the economical stages of all ages and nations, from primitive man to the eighteenth century, are reviewed; and thirdly, the products, industries, and commerce of the nations of the present, which occupy the second part of the first and the whole of the second volume. While the conditions of the country in and for which the book was written are naturally given a large part of the book, it is far from being only a commercial geography of Germany, and readers of any nationality will find it an excellent source of brief information on the essential features of their own country in regard to the topics treated. The illustrations—those in the text as well as the coloured plates—are fully up to the reputation of the publishers, and the maps present in themselves a complete atlas of commercial and economic geography. The book ought to be given a place in the library of every commercial high school whose course stands for more than mere mechanical drill in the theory and practice of business.

M. K. G.

Canada in the Twentieth Century By A. G. Bradley. xii and 428 pp.,
Map, 50 Illustrations, and Index. E. P. Dutton & Co., New York, 1904. (Price, \$4.)

We have seen no book that gives so good a picture of Canada and Canadian life as is found in this work. The development of the Dominion has been remarkably rapid in the past few years, and inquiries have been made for a book of this general character. We are glad the want is supplied at last. Of recent

books, Lumsden's is perhaps more thorough than this one in its treatment of the wheat and ranch regions of western Canada, but practically all of it is devoted to these prairie lands. Fraser's book is a panoramic view of the Dominion from sea to sea, giving the essence of many things but with briefest treatment of each topic. Every page of Mr. Bradley's work gives solid information in very readable form, and it treats of the whole Dominion excepting the maritime provinces of Nova Scotia, New Brunswick, and Prince Edward Island. But it is not overladen with data. There is much practical information which the immigrant may need, for example, that is not found in these pages. Little is told of the history, geography, or politics of the country, but the author, in no superficial manner, devotes himself to the life of all parts of the land and the conditions amid which the people are working out their problems. The illustrations are characteristic. The map should be revised for the next edition to insert the two new provinces of Saskatchewan and Alberta, and to show the present extent of railroad-building.

The wheat lands of the West, of course, cannot always be over-cropped; and to keep them in a high degree of fertility, the author thinks that the farmer will ultimately have recourse to turning under green crops, as clover does not seem to flourish in that region.

The Native Races of South Africa. By George W. Stow. Edited by George McCall Theal. xvi and 618 pp., 22 Illustrations, Map, and Index. Swan, Sonnenschein & Co., Lim't'd, London, 1905.

The author lived in South Africa from 1843 until his death, over twenty years ago. His widow sold the manuscript of this book to Miss Lucy C. Lloyd, who herself had devoted many years to the study of the Bushman race. Other work prevented her from giving the manuscript the care needed for its publication, and in 1904 she submitted it to Dr. Theal, who was convinced upon reading it that no production of such value upon the native races of South Africa had yet appeared. Several authorities on the races of South Africa have expressed high opinion of its importance.

The author drew a detailed and accurate picture of the mode of life, physique, beliefs, and environment of these primitive hunters, who were in the Stone age when Europeans first saw them, though, long before, some of the tribes had developed remarkable illustrative ability. The wall paintings of the Bushmen show many of the animals of South Africa more accurately than the drawings of European animals made by the European cave men. A considerable number of Mr. Stow's illustrations are in colours, showing the wall paintings, carved work, implements, rock chipping, etc., of the Bushmen and other tribes.

While a large proportion of the book deals with the Bushmen and their former life, a great deal of the valuable material relates to the Hottentots and their hybrids, the Damaras, and especially the great Bechuana, or Basuto section of the Bantu peoples. The author gives an interesting account of one of the strangest events in South African history—the invasion of the Mantati cannibals, who came down on South Africa from the northeast, sparing no human being in their way. The first missionaries had then reached the Bechuana country from the south, and they enabled the tribes among whom they had settled to make a successful stand against the invaders, who finally turned back to the unknown regions from which they came.

All the tribes of whom Mr. Stow writes in this book have to-day been more or less modified by their intercourse with the whites. It is fortunate that these

fine studies of changing and vanishing peoples were written before the natives had come under the influence of the white race. There are imperfections in the book, for much study has been given to these races since Mr. Stow wrote; but his work is certain to be regarded as one of the most valuable compilations of anthropological material relating to the aborigines of South Africa.

The Story of the Zulus. By J. Y. Gibson. viii and 276 pp., Illustrations and Index. P. Davis & Sons, Pietermaritzburg, Natal, 1903.

Every white man in South Africa respected the power of the Zulu nation up to the time of the fall of Cetshwayo its last king, in 1884. The fame of this all-conquering people had spread farther than South Africa, and its greatness was the favourite topic among all the tribes. This book tells the story of the Zulus from an earlier day than the time of Tshaka, the first great Zulu king, in the early years of the last century, until after the annexation by the British of all that was left of the Zulu country in 1887. Mr. Gibson, who was for some years a magistrate in Zululand, has rendered a service in carrying through this literary task; for the time when reliable information may be obtained from Zulu sources is rapidly passing away. He evidently collected his data with much care, and has aimed at accuracy in all his statements. The author shows the Zulus in many phases of their lives and history; and it is certain that no barbarous African people has a more remarkable history than this small part of the great Bantu family.

Nach der Oase Tugurt in der Wüste Sahara. By Walter Bander. 250 pp. Buchdruckerei Kreis, Basel, 1903.

A sprightly narrative of travel written by a careful observer. Though the book adds nothing to our geographical knowledge, it deals with a region whose northern edge is visited by more and more tourists every year. The little work should be helpful to those who sojourn at Biskra, while at the same time it will interest the general reader. The author tells of the ruined fortifications at Biskra, reminders of the day now gone, when it was necessary to have defences along the edge of the Sahara as a protection against the incursions of desert nomads.

The Siege of the South Pole. By Hugh R. Mill. xvi and 455 pp., Illustrations, Map in Colours by J. G. Bartholomew, Appendix, and Index. Frederick A. Stokes Company, New York, 1905. (Price, \$2.60.)

The only books in English on the Antarctic regions as a whole are Dr. Fricker's "The Antarctic Regions," and "The Siege of the South Pole," which has recently appeared from the pen of Dr. Mill. While both are authoritative works, they differ essentially from one another. Dr. Mill does not attempt to describe the polar regions or their peculiar conditions, but simply tells the story of Antarctic exploration up to the present time; while Dr. Fricker, after giving the history of discovery in that part of the world, devotes more than one-half of his book to a geological and geographical description of the regions visited.

But Dr. Fricker's scholarly book was written before any of the five recent expeditions had gone south; Dr. Mill's book completes the record of exploration, for it includes the Charcot expedition, which was the latest to enter and to leave the field. It is a well-knit recital of the whole story of South Polar endeavour, told with literary skill and, of course, with the geographical insight

that marks all of Dr. Mill's writings. This is a book that every student or writer who has to do with polar topics must have within reach. Dr. Mill devotes a chapter to Wilkes, and does not belittle what he really achieved.

With the Abyssinians in Somaliland. By Major J. Willes Jennings and Christopher Addison. xii and 265 pp., 68 Illustrations and Sketch Map. Hodder & Stoughton, London, 1905. (Price, 10s. 6d.)

The authors had an opportunity to participate in the campaign of 1903-04 against the Mad Mullah in Somaliland, serving as medical officers in the Abyssinian army, which co-operated with the British force. The description of the new railroad from Jibuti, of the town of Harrar, formerly forbidden to non-Mohammedans, and of the military organization of the Abyssinians and their methods of carrying on a campaign, is of novel interest, and much of the book is about a country and people that have not yet been thoroughly studied.

Berlin and Its Environs. Handbook for Travellers. By Karl Baedeker. Second Edition. x and 247 pp., 6 Maps, 18 Plans, and Index. Karl Baedeker, Leipzig, 1905. (Price, M. 3.)

A thorough revision of this handbook to the largest purely modern city in Europe. A map of the city in three sections is on a scale of over 3 miles to an inch.

L' Eruzione dell' Etna nel 1892. Vol. I. Storia e Descrizione, con 6 Tavole e 7 Figure nel testo, per A. Riccò e S. Arcidiacono, R. Osservatorio, di Catania ed Etneo. 8vo. Catania, Stab. Tip. C. Galàtola, 1904.

The tokens of activity of a volcano may not be real life, but when described in a journal of observations they appear to constitute something more than mechanical manifestations. Volcanoes, if not properly "living mountains," are at least the most active ones. Next to them come, in the order of activity, the Alpine chains, with their constantly-changing glaciers.

It is an intensely interesting task to follow, day after day, hour for hour, the palpitations of one of the great safety-valves of the earth's crust, and when to ocular observation is added the unbroken record of sensitive instruments, we obtain a picture, not merely of the externally perceptible results of volcanic action, but, to a certain extent, of the internal processes that cause them. This is the great merit of the labours of the Royal Observatory of Catania in Sicily, part of the results of which are presented in this volume.

A detailed report on the eruptions of 1883 and 1886 precedes the body of observations on that of 1892, and details are carried so far, even, as to give the condition of the volcano almost daily after May of 1886. The regular Journal of Ætna's activity begins in July, 1892, and is continued to the end of the year (Part III), but further explorations and observations are added, till the end of October, 1896.

To follow in detail these studies far exceeds the limits of a review. It suffices to acknowledge the consummate care and conscientiousness with which they have been carried on, both by instrumental record and by ocular scrutiny. Nor is this volume the final word; the total results can only be appreciated when the work will be complete. But the map accompanying this first part gives an idea of, and foreshadows partly, these results. It establishes: that the eruptions of 1883 and 1886 took place considerably to the south of the central crater, and

that, in continuation of the fracture then commenced, the eruption of 1892 advanced farther towards the summit of the volcano, around which cluster the hearths of the outbreaks of 1819, 1869, and 1879. The character of the eruptive areas, from 1883 to 1892 inclusive, therefore, justifies the designation of "radial fractures," applied to them by the observers of the Catania Observatory.

Most interesting outline sketches and valuable photographs adorn this important contribution to vulcanology and seismology. A. F. B.

Die Erde in der Zeit des Menschen (Leben und Wissen, Band 5). By **Willy Pastor**. 286 pp. Eugen Diederichs, Jena, 1904. (Price, M. 5.50.)

A readable book in which the author attempts to trace the history of the development of mankind. The essay is marked by much literary skill, but leaves many periods of time and many races of men entirely out of the account. The author especially emphasizes the importance of early religious faiths, which strongly influenced the development of languages and the invention of characters or hieroglyphics by which to record speech. He makes use of few of the discoveries or hypotheses of the anthropologists.

Captain John Smith. By A. G. Bradley. viii and 226 pp. and Map. Macmillan & Co., London, 1905. (Price, 2s. 6d.)

This is one of the volumes in the "English Men of Action" series in which a number of the foremost writers have written biographies of some of England's great men. These books are accurate and readable, and are sold for a small sum. The adventures of Captain John Smith have a romantic as well as an historical interest; for he was a man of thrilling experiences and many narrow escapes, and his deeds are a part of the history of pioneer days in Virginia. The author believes with the late John Fiske that the Pocahontas story was true, and he gives both facts and reasons for defending Smith's veracity. This book is one of the best of the series.

Ceylon in 1903. Describing the Progress of the Island since 1803. By John Ferguson. clxiii and 198 pp., numerous Illustrations, 9 Appendices, and Index. A. M. & J. Ferguson. Colombo, 1903. (Price 7s.)

The fifth publication of a work that, for over twenty years, has been one of the fullest and best sources of information concerning the island. Besides an historical review it contains the most recent facts on a large variety of topics and describes the present agricultural and commercial enterprises and the attractions which the island has to offer to tourists. The author asserts that British capital, invested in the development of coffee, tea, and other plantations, has been the largest influence in more than doubling the population and in greatly improving the condition of the Cingalese in respect of their education, houses, clothing, and food.

The Moravians in Georgia, 1735-1740. By Adelaide L. Fries. 252 pp., 15 illustrations, and Index. Printed for the Author by Edwards & Broughton, Raleigh, N. C., 1905.

The story of those industrious, fearless, conscientious Germans, long persecuted for their religious faith at home, who were permitted at length to seek refuge in Georgia, reaching Savannah in its earliest days. The movement

was pregnant in results, though historians have largely ignored this first planting of a Moravian colony in America. The author's material concerning the Georgia settlers was drawn entirely from original manuscripts found in Germany and this country, and so far the book is a distinct contribution to the history of those pioneer days in Georgia.

OBITUARY.

WALTER R. T. JONES.

Walter R. T. Jones became a Fellow of this Society in 1871, and was elected Treasurer on January 12th, 1886. He discharged the duties of that office until his decease, which occurred in this City on March 26th last.

In the death of Mr. Jones this Society has lost a faithful and efficient officer and the community a worthy citizen.

Mr. Jones graduated from Columbia College (now Columbia University) in the Class of 1850, and, for the greater part of the year after his graduation, travelled in Europe. On his return to this City he studied law and subsequently engaged in the business of Average Adjusting in connection with Marine Underwriting.

His conservatism manifested itself in his continuing with the same associate in business for over half a century.

In 1854 Mr. Jones married Anna Pierson Bailey, daughter of Capt. Theodorus Bailey, United States Navy, who, after the Civil War, attained the rank of Admiral.

The fruit of this marriage was a daughter and a son. The son died in 1879, Mrs. Jones some years later, and the daughter, wife of Major C. W. Whipple, United States Army, with her five children, survives.

Mr. Jones possessed rare qualities of heart and mind, yet modesty and simplicity were his chief characteristics.

He was wise in counsel and of unswerving integrity; strong in his attachments, generous and considerate with his adversaries.

It is a pleasurable duty to make recognition of his worth while recording the loss to this Society in his death.

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